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OF THE  
ROYAL GEOGRAPHICAL SOCIETY  
OF  
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1851.

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YEAR 1907

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# Royal Geographical Society,

1851.

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## REPORT OF THE COUNCIL,

READ AT THE ANNIVERSARY MEETING, 26TH MAY.

THE Council have this year to make a Report upon the state of the Society, which they trust will give general satisfaction, not only as indicating a progressive increase in its numbers, but as showing that its finances also are at length restored to a healthy and improving condition.

The number of new members elected since the last anniversary is 44, whilst the vacancies are only 24, of which 16 are from death.

*Finances.*—The disposable income of the Society, as estimated for 1850, was—

£854 1 4

It actually realized 1047 16 11

Being an increase of £193 15 7 beyond what had been anticipated, and leaving, on the 1st of January last, a balance in favour of the Society of 170*l.* 14*s.* 1½*d.*, besides 30*l.* 4*s.* 7*d.* belonging to the Library Fund, applicable to the particular purpose for which that fund was raised.

Including the balance above mentioned of 170*l.* 14*s.* 1½*d.*, the Council consider that they may fairly estimate the income for the current year at 1102*l.* 16*s.* 9½*d.*, as will be seen on reference to the printed particulars.

The amount of the funded property of the Society remains unaltered since last year—2224*l.* 1*s.* 10*d.*, 3½ per cent. Consols.

*Arrears.*—By the accounts for the last year, laid before you, you will observe that under this head 120*l.* was received, and placed to the credit of the Society. It is estimated that 50*l.* more may be recovered, which sum is included in the estimated income for the current year.

*Accessions to Library.*—The collections of printed books and maps have received many valuable additions, amongst which must be especially mentioned a munificent gift from the Imperial Military Geographical Institute of Austria, of a collection of their most important works, selected to be sent to this country to be shown at the World's Exhibition, after which they are to be delivered over to this Society. In addition to the above may be mentioned the Map of the Caucasian Isthmus, by Koch; The Topographical Atlas of Bavaria; Vidal's Map of Portugal; The Trigonometrical Survey of the Western and Northern Coast of Norway; The Atlas of Spain, by Coello and Madoz; The Reconnoissance of the Western Coast of the United States, from Monterey to the Columbia River, by Lieutenant M'Arthur, U.S.N., &c. &c. A detailed list of the maps in question will be laid before you in the printed lists of annual donations under this head.

*Instruments.*—The stock of instruments belonging to the Society has also been largely increased by a valuable bequest from the late Robert Shedden, Esq., a Fellow of this Society, who died at Mazatlan in the course of a voyage round the world, made at his own expense in his yacht, the Nancy Dawson. Mr. Shedden had passed up Behring's Straits, and accompanied the boats of H.M.S. Plover, to which he rendered great assistance during their search for the lost Sir John Franklin. Among these instruments are three excellent chronometers.

*Royal Premium.*—The Royal donation of fifty guineas for the “Encouragement of Geographical Science and Discovery” has been this year divided between Dr. George Wallin, of Finland, for his interesting and important travels in Arabia, and Mr. Thomas Brunner, for his meritorious labours in exploring a large extent of the N.W. portion of the Middle Island of New Zealand. The last Number of our Journal contains accounts of the travels of both these individuals; and the President will state in his Address the grounds which, in the opinion of the Council, have entitled them to the awards in question.

*Publications.*—Since our last anniversary, two Parts of the Society’s Journal have appeared, and may be had on application by all members.

The greatly increased size of these Numbers, as well as the importance of some of the papers which they contain, afford the best proof that valuable materials of great interest will not fail to be forthcoming so long as the Society is prepared with the means of giving them in this form to the public.

The state and prospects of our finances, as now submitted to you, are such as to justify, in the opinion of the Council, *even a larger* expenditure than last year under this head. In the present circumstances of the Society, they feel that to diffuse, as well as to acquire, useful knowledge, is the best service they can render to the public.

*In conclusion*, if the Council have nothing more definite to say to you this year upon the subject of their application to her Majesty’s Government or suitable apartments, it is not because the matter has in any way been lost sight of or neglected on their part.

The strong claims of the Society have been fully laid before her Majesty’s Government; and the Council confidently expect that they will be attended to. In the mean time, through the

consideration and kindness of the Principal and Council of King's College, Somerset House, the Society has been provided for the *remainder of the present session* with improved accommodation for their evening meetings, the attendance at which had become (it may be fairly assumed from the increasing interest of the subjects) much too numerous to be held as heretofore in the smaller apartments of the Society.

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*Dr.*

## BALANCE-SHEET FOR THE LIBRARY FUND, 1850.

*Cr.*

	£.	s.	d.		£.	s.	d.
Balance from 1849 . . . . .	41	6	11	Repairing Cartoons . . . . .	1	4	6
Subscription . . . . .	1	1	0	Binding Books . . . . .	10	18	10
				Balance carried to 1851 . . . . .	30	4	7
	<u>£42 7 11.</u>				<u>£42 7 11</u>		

Examined and found correct.

GEO. WHITMORE,  
E. OSBORN SMITH,} *Auditors.*ROBERT BIDDULPH, *Treasurer.**Receipts.*

## ESTIMATE FOR THE YEAR 1851.

*Expenditure.*

	£.	s.	d.	£.	s.	d.		£.	s.	d.	£.	s.	d.
Balance at Banker's, January 1, 1851 . . . . .	157	12	1				Journal . . . . .	300	0	0			
„ of Petty Cash in Secretary's hands . . . . .	-13	2	0½				„ Illustrations . . . . .	50	0	0			
				170	14	1½					350	0	0
Subscriptions of 225 Fellows at 2 <i>l.</i> . . . . .				450	0	0	Rent and Fixtures . . . . .				263	13	0
Compositions of 4 Fellows, at 25 <i>l.</i> . . . . .				100	0	0	Salaries and Wages . . . . .				260	0	0
Entrance of 30 Fellows at 3 <i>l.</i> . . . . .				90	0	0	Office Expenses . . . . .				70	0	0
Arrears, estimated to be paid . . . . .				50	0	0	Royal Premium . . . . .				52	10	0
Sale of Journals . . . . .				90	0	0	Expenses attending Meetings at Somerset House . . . . .				20	0	0
Dividends on 2200 <i>l.</i> Stock . . . . .				69	12	8	Purchase of Books and Maps . . . . .				20	0	0
Royal Premium . . . . .				52	10	0	Miscellaneous Printing . . . . .				20	0	0
Borneo Mission . . . . .				30	0	0	Furniture and Repairs . . . . .				10	0	0
							Insurance and Advertisements . . . . .				10	0	0
							Sundries . . . . .				26	13	9½
				<u>£1102 16 9½</u>							<u>£1102 16 9½</u>		

NORTON SHAW, *Secretary.*

\* Balance-Sheet for Library Fund, and Estimate for 1851.

## Library Regulations.

I. The Library shall be open every day in the week (Sundays excepted) from *Eleven* in the morning to *Five* in the afternoon, except on New Year's Day, Good Friday to Easter Monday inclusive, and Christmas week; and it shall be closed one month in the year, in order to be thoroughly cleaned, viz. from the first to the last day of September.

II. Every Member of the Society shall be entitled (subject to the Rules) to borrow as many as four volumes at one time.

*Exceptions :*

1. Dictionaries, Encyclopædias, and other works of reference and cost, Minute Books, Manuscripts, Atlases, Books and Illustrations in loose sheets, Drawings, Prints and unbound Numbers of Periodical Works, *unless with the special written sanction of the President.*
2. Maps or Charts, *unless by written order of the President, Council, or Secretaries.*
3. New Works before the expiration of a month after reception.

III. The title of every Book, Pamphlet, Map, or Work of any kind lent, shall first be entered in the register, with the borrower's signature, or accompanied by a separate note in his hand.

IV. No work of any kind shall be retained longer than one month; but, at the expiration of that period, or sooner, the same shall be returned free of expense, and may then, upon *re-entry*, be again borrowed, provided that no application shall have been made in the mean time by any other Member.

V. In all cases a list of the Books, &c., or other property of the Society, in the possession of any member, shall be sent in to the Secretary *on or before the 1st of July in each year.*

VI. In every case of loss or damage to any volume, or other property of the Society, the borrower shall make good the same.

VII. No stranger shall be admitted to the Library except by the introduction of a Member, whose name, together with that of the Visitor, shall be inserted in a book kept for that purpose.

VIII. Members transgressing any of the above Regulations shall be reported by the Secretary to the Council, who will take such steps as the case may require.

By Order of the Council,

NORTON SHAW, *Sec.*

December 9, 1850.

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  - 27. Thermometrical Boiling Water Apparatus, for Heights.
  - \*28. Case of Wooden Ruling Scales.
  - \*29. Achromatic Telescope ( $3\frac{1}{2}$  feet), 2 inches aperture.
  - \*30. Sliding Tube Do. (3 feet),  $1\frac{1}{8}$  inches aperture.
  - \*31. Night, or Comet-Sweeping Telescope, 2 feet focus, and 5 inches aperture.
  - 32. Set of Magnets.
  - \*33. Mountain Barometer, by Troughton and Simms.
  - 34 and 35. Two Newman's Improved Iron Cistern Mountain Barometers.
  - †36. Square-framed Mountain Barometer, by Newman.
  - \*37. Mountain Barometer, by Troughton and Simms, with Tripod Stand.
  - \*38. Dipping Instrument.
  - 39. Telescope.
  - 40 and 41. Two Compasses. } Lent to Mr. Duncan, Vice-Consul at Whydah, in 1849.
  - 42. Aneroid Barometer.
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**Proceedings of the Royal Geographical Society of London.**

**SESSION 1850-51.**

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*First Ordinary Meeting, November 11, 1850.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

*Joseph Bainbridge, Esq., was elected a Fellow.*

The President informed the Meeting that their late Fellow, Robert Shedden, Esq., the proprietor of the 'Nancy Dawson' yacht, had bequeathed the whole of his valuable nautical and mathematical instruments to the Society.

The President announced that the First Part of the Twentieth Volume had been published during the Recess, by the Secretary, and would, as usual, be presented, upon application, *free*, to the Fellows.

A letter was read from Colonel Frémont, returning thanks for the Victoria Gold Medal.

A letter was read from Mr. Frank Galton, who was about to penetrate, with his party, to the South African Lake, *viâ* Walwish Bay.

The Papers read were—

1. A Summary of Recent Arctic Operations, by Mr. A. Cartwright.
2. Voyage of the 'Prince Albert' to the Arctic Seas, by Commander Forsyth, R.N.
3. Considerations on the Isthmus of Central America, by Captain Fitz-Roy, R.N. (first portion).

*Second Ordinary Meeting, November 25, 1850.*

The President, Capt. W. H. SMYTH, in the Chair.

*Admiral Lord Radstock; E. B. Lawrence, Esq.; Capt. C. T. Wilson, of the Guards; Commander Ch. C. Forsyth, R.N.; George C. Cunningham, Esq.; Robert N. Fowler; Capt. J. W. Espinasse, of H.M. 12th Reg.; James Bell, Esq.; The Right Hon. Andrew Rutherford, M.P., Lord-Advocate of Scotland; Capt. Fred. E. Forbes, R.N.; and James Inray, Esq., were elected Fellows.*

The Paper read was—

Considerations on the Isthmus of Central America, by Capt. Fitz-Roy, R.N. (second portion).

*Third Ordinary Meeting, December 9, 1850.*

Admiral Sir CHARLES MALCOLM, Vice-President, in the Chair.

*H.R.H. Carl Ludwig Eugène, Crown Prince of Norway and Sweden; His Excellency the Chevalier Bunsen, Minister Plenipotentiary and Envoy Extraordinary of H.M. the King of Prussia; and His Excellency the Hon. Abbott Lawrence, Minister Plenipotentiary from the United States of America, were elected Fellows.*

The Paper read was—

Considerations on the Isthmus of Central America, by Capt. Fitz-Roy, R.N., upon which an animated discussion followed, in which the Author, Colonel Lloyd, Mr. Evan Hopkins, Mr. Macqueen, Dr. Cullen, Mr. Tyler, Mr. Trelawney Saunders, Capt. Moorson, C.E., and Mr. O'Gorman took part.

*Fourth Ordinary Meeting, January 13, 1851.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

*Capt. Ed. A. Inglefield, R.N., and George Murray, Esq., were elected Fellows.*

The Papers read were—

1. Progress of the Mission to Central Africa, consisting of Messrs. Richardson, Barth, and Overweg, by Augustus Petermann, Esq.
2. On the Climatology of the Region between the Caspian and the Black Seas, by Professor H. Abich.

*Fifth Ordinary Meeting, January 27, 1851.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

*Capt. the Hon. Henry A. Murray, R.N.; Wm. Evelyn, Esq., M.P.; Capt. the Hon. W. F. Scarlett, of the Guards; John Dover, Esq.; and Rear-Admiral David Price, were elected Fellows.*

The Papers read were—

1. Memoranda relating to Hong Kong, by W. Scott, Esq.
2. Survey of the Louisiade Archipelago and the S.E. Coast of New Guinea, by the late Capt. Owen Stanley, R.N., with Notes on the Natural History of the same, by Mr. Mac Gillivray, the naturalist to the expedition.

*Sixth Ordinary Meeting, February 10, 1851.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

*John A. Warre, Esq., F.R.S., was elected a Fellow.*

The Papers read were—

1. Ascent of Popocatepetl in Mexico, by Ed. Thornton, Esq., of the Foreign Office.
2. Comparison between Newman's Standard and the Aneroid Barometers, by Col. Ph. Yorke, F.R.S.
3. Note on the Ascent of the Nile, by the Rev. Dr. Knoblicher; communicated by the Secretary.
4. Account of a large Lake in South Africa, to the north of Lake Nğami, by the Rev. D. Livingston.

*Seventh Ordinary Meeting, February 24, 1851.*

Admiral Sir CHARLES MALCOLM, Vice-President, in the Chair.

*Francis D. P. Astley, J. Bartlett Hyde, and John Jennings, Esqs., were elected Fellows.*

The Papers read were—

1. Survey of the Southern portion of the Middle Island of New Zealand, by Capt. J. Lort Stokes, R.N.
2. On the Adaptation of the Aneroid Barometer to Surveying purposes in India, by Dr. G. Buist, LL.D.

*Eighth Ordinary Meeting, March 10, 1851.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

*Lieut. Francis Du Cane, R.E.; Lord Moreton; Ch. H. Bracebridge, Esq.; and Lieut.-Col. Niel Campbell, were elected Fellows.*

The Papers read were—

1. Proceedings in the South Sea Islands, by Capt. J. E. Erskine, R.N.
2. Account of the Island of Ruatan, by Commander R. C. Mitchell, R.N.

Among the subjects exhibited were a Model of the Bernese Alps; an Atlas of Moravia, Silesia, Styria, and Illyria; a new Map of Borneo, by Mr. Petermann; and of the Isthmus of Central America, by Mr. Arrowsmith.

*Ninth Ordinary Meeting, March 24, 1851.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

*Lieut.-Col. W. H. Sykes, F.R.S., and John Mac Gillivray, Esq., Naturalist to the surveying ship 'Rattlesnake,' were elected Fellows.*

The Papers read were—

1. On the Mountain of Colesberg, in South Africa, by Dr. Orpen.
2. Letter from Dr. Barth to Dr. Beke on the Mission to Central Africa.
3. Observations on the Geography of Southern Peru, by William Bollaert, Esq. (first portion).

The President announced that the remaining Meetings of the Society during the Session would, by the kind permission of the authorities, be held in the large apartments of King's College, Somerset House.

*Tenth Ordinary Meeting, April 14, 1851.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

*Lord Viscount Palmerston, G.C.B.; Frederick Mocatta, Esq.; Edward Weller, Esq.; and the Chevalier Jacob Swart, of Amsterdam, were elected Fellows.*

The President announced that the Second Part of Vol. XX. was published by the Secretary, and would, as usual, be, upon application, delivered *free* to the Fellows.

The Paper read was—

On the Identification of the Biblical Cities of Assyria and on the Lower Tigris, by Lieut.-Col. Rawlinson, C.B.

The thanks of the Society were unanimously voted to the authorities of King's College for their kindness in granting the use of their

1 *Proceedings of the Royal Geographical Society.*

spacious apartments during the remaining evening Meetings of the present Session.

*Eleventh Ordinary Meeting, April 28, 1851.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

*Charles Evans, Esq., of Rugby, was elected a Fellow.*

The Paper read was—

On the Geography of Southern Peru, by Wm. Bollaert, Esq. (second portion).

General Walbridge and J. W. Wright, Esq., of California, exhibited numerous beautiful specimens of the rich ores of that country.

*Twelfth Ordinary Meeting, May 12, 1851.*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

The Paper read was—

On the Physical Geography of the Provinces of Kumáon and Garhwál, by Capt. R. Strachey.

Thanks were voted, as usual, to the author of the paper, and at the same time to Mr. Arrowsmith for his beautiful diagram in illustration of it.

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ANNIVERSARY MEETING, 1 P.M., MAY 26, 1851.

*(Held at King's College, Somerset House.)*

The President, Capt. W. H. SMYTH, R.N., in the Chair.

The Minutes of the last Meeting having been read and confirmed, Aug. Petermann and Jno. Brown, Esqs., were appointed Scrutineers for the Ballot. The Report of the Council, together with the Balance-sheet for 1850, and the Estimates for 1851, was read and adopted. The President then reported the grounds on which the Council had awarded the Royal Premium, "for the Encouragement of Geographical Science and Discovery," to Dr. George Wallin of Finland, and Mr. Thomas Brunner of New Zealand (see p. liii., liv.). The Anniversary Address was next read, when a vote of thanks was unanimously passed, with a request that the President do allow the Address to be printed.

At the conclusion of the Ballot the Scrutineers reported to the President that the changes recommended by the Council had been adopted, and that the following had been duly elected:—

*President.*—Sir RODERICK IMPEY MURCHISON, G.C.St.S., F.R.S., &c., Corr. Inst. Fr.

*Vice-Presidents.*—Capt. W. H. SMYTH, R.N., K.S.F., D.C.L.; Sir WOODBINE PARISH, K.C.H., F.R.S.; Sir GEORGE BACK, R.N., F.R.S.; Admiral Sir C. MALCOLM, Hon. President of the Bombay Geographical Society, M.R.A.S., &c.

*Treasurer and ex-officio Trustee.*—ROBERT BIDDULPH, Esq.

*Trustees.*—Sir GEO. T. STAUNTON, Bart., M.P., F.R.S.; W. R. HAMILTON, Esq., F.R.S.

*Honorary Secretaries.*—Colonel PHILIP YORKE, F.R.S., &c.; THOMAS HODGKIN, Esq., M.D., &c.

*Council.*—JOHN ARROWSMITH, Esq., F.R.A.S.; Admiral Sir F. BEAUFORT, K.C.B., F.R.S.; Right Hon. Lord COLCHESTER, R.N.; Sir H. T. DE LA BECHE, F.R.S.; Lord DE MAULEY, F.R.S.; Sir C. FELLOWS, M.R.I.; Capt. ROBERT FITZROY, R.N., F.R.S.; G. BELLAS GREENOUGH, Esq., F.R.S.; W. J. HAMILTON, Esq., F.G.S.; JOHN HOGG, Esq., M.A., F.R.S.; JOHN LEE, Esq., LL.D., F.R.S.; Lieut.-Col. J. A. LLOYD, F.R.S.; Lord LONDESBOROUGH, F.R.S.; GEORGE LONG, Esq., M.A., Professor; JAMES MURRAY, Esq. (Foreign Office); Duke of NORTHUMBERLAND, R.N., F.R.S.; GEORGE O'GORMAN, Esq., F.G.S.; Lieut.-Col. H. C. RAWLINSON, C.B., D.C.L.; Lieut. H. RAPER, R.N., F.R.A.S.; Rev. G. C. RENOUARD, B.D., F.R.A.S.; Sir W. C. TREVELYAN, Bart. M.A.

The thanks of the Meeting were next separately voted to the Retiring President, Vice-Presidents, Hon. Secretaries, and Members of the Council, as well as to the Auditors and Scrutineers.

The President finally directed the attention of the Society to the usual Anniversary Dinner, at which his successor, Sir Roderick Murchison, would preside; and the Meeting adjourned at 4 P.M.

*Thirteenth Ordinary Meeting, June 9, 1851.*

The President, Sir RODERICK I. MURCHISON, in the Chair.

The Papers read were—

1. On a Canal in Costa Rica, *viâ* the Sapoa, to Salinas Bay; by Mr. A. S. Oersted, of Copenhagen.
2. On the Language spoken in the Cocos Islands, by Dr. R. G. Latham.
3. Note on the Ruins of Cesarea, by the Vice-Consul at Jaffa.
4. On a more rapid Communication between the Populations of Europe and Asia, by Asa Whitney, Esq., of New York.

The President announced that, in closing the season, he would give two Geographical Soirées at his house in Belgrave Square, which he hoped to see numerously attended by the Fellows.

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MISCELLANEOUS.

*Twenty-first Meeting of the British Association for the Advancement of Science, held at Ipswich, July 2 to 10, 1851. Section E, Geography and Ethnology.*

*President.*—Sir RODERICK I. MURCHISON, Pres. R. G. S.

*Vice-Presidents.*—Right Rev. the BISHOP of OXFORD; Capt. Sir JAMES ROSS, R.N.; Capt. ROBERT FITZ-ROY, R.N.; Lieut.-Col. RAWLINSON; and Dr. R. G. LATHAM.

*Secretaries.*—DR. NORTON SHAW, Sec. R. G. S.; Rev. J. W. DONALDSON, D.D.; R. CULL, Esq., Sec. Ethn. Soc.

*Committee.*—His Excellency the Chevalier BUNSEN; Capt. Sir J. ALEXANDER, R.E.; Dr. CHARLES BEKE; JOHN CRAUFURD, Esq., F.R.S.; R. CUST, Esq.; Dr. TH. HODGKIN; Dr. HAMEL, of Russia; The MAYOR of IPSWICH; The Rev. C. G. NICOLAY, M.A.; Capt. R. STRACHEY; JOHN STRACHEY, Esq.; Col. REID; Rev. J. S. RIGAUD; Mr. PIERRE and Mr. PLATON DE TCHIHATCHEF; ASA WHITNEY, Esq., of New York; Col. PH. YORKE; Mr. D'ABBADIE; Capt. LOCKE LEWIS; Major CARMICHAEL SMYTH; Dr. J. LEE, F.R.S.; F. TUCKETT, Esq.; The Earl of SHEFFIELD; CH. WENTWORTH DILKE, Esq.; and J. WINTERBOTTOM, Esq.

The Papers read were—

1. Ethnological Researches in St. Domingo, by Sir R. Schomburgk.
  2. Notes on the Topography, Meteorology, and Botany of Asia Minor, more particularly with reference to Mount Argæus and the surrounding Tracts, by M. Pierre de Tchihatchef.
  3. Plan for a more rapid Communication between the Populations of Europe and Asia, by Asa Whitney, Esq., of New York.
  4. Characteristics of the Inhabitants of Lower Bengal, by Dr. Young.
  5. On Ethnological Classification, by the Rev. J. W. Donaldson, D.D.
  6. Summary of Recent Nilotic Discovery, by Dr. Charles Beke.
  7. Notes on the Geography of Borneo, by J. Craufurd, Esq.
  8. Synopsis of Abyssinian Tongues, by Mr. D'Abbadie.
  9. Ascent of Mount Ararat, by Mr. Khanikoff and Col. Khodzko.
  10. On the Origin and Institutions of the Cimri, by Mr. C. B. Beaumont.
  11. On the Ethnology of the Norse and the Saxons, by Mr. Saul.
  12. Physical Geography of the Provinces of Kumáon and Garhwál, by Capt. R. Strachey.
  13. Recent Earthquake in Chile, by Mr. Budge.
  14. Note on the Geography of the Northern part of Borneo, by Sir J. Brooke.
  15. Notes to accompany a Map of Cambodia, by Mr. W. Earl.
  16. Late Surveys of the Middle Island of New Zealand, by Capt. J. L. Stokes, R.N.
  17. On the Volcanic Island of Milo, by Lieut. Leycester, R.N.
  18. Remarks on the Locality of the Meteoric Iron of Atacama, by Mr. W. Bollaert.
  19. On the Negro Races of the Indian Archipelago and the Islands of the Pacific, by John Craufurd, Esq.
  20. On the Ethnological Position of the Brahuís, and on the Languages of the Paropamisus, by Dr. R. G. Latham.
1. Notes on the Australians, by Mr. Townsend.

*The next Meeting of the British Association will be held at Belfast.*



PRESENTATION  
OF THE  
ROYAL PREMIUM

AWARDED TO DR. GEO. A. WALLIN OF FINLAND, AND  
TO MR. THOMAS BRUNNER OF NEW ZEALAND.

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The Annual Report of the Council having been read, the President addressed the Meeting as follows :—

GENTLEMEN,—We have acted again upon the principle followed last year in the case of the Rev. David Livingston, of distributing in *money* the amount of the Royal Grant entrusted to us for the “Encouragement of Geographical Science and Discovery,” to those travellers who, in the opinion of your Council, have established for themselves strong claims to participate in the fund in question, when no case has arisen of sufficient importance to justify the award of the highest honour at the disposal of the Society. The Council has this year divided the sum of 50 guineas equally between Dr. George Augustus Wallin, of Helsingfors in Finland, and Mr. Thomas Brunner, an explorer of New Zealand; and, although the results of the labours of both these gentlemen are printed in the last Number of your Journal, the duty devolves upon me to show you the grounds of this decision.

Dr. Wallin has traversed a large portion of the Peninsula of Arabia hitherto untrodden by Europeans, and has collected in the course of his travels a large amount of geographical information of very great interest, which he has communicated to the Society. This founds the claim for the Council's award; but I may state the successive steps by which this energetic traveller succeeded in almost identifying himself with the Arabs of the Desert.

Having studied the Eastern languages in his native town, he obtained a pension from his Government, with permission to travel in the Levant. At Alexandria he formed an acquaintance with a learned sheikh, whom he accompanied to Caïro, and by whom he was introduced to some Bedowin Arabs. With them he, for a considerable time, took up his abode, and soon became so fond of this mode of living, that—like our countryman, the intrepid and greatly re-

gretted Browne—he was tempted to think the simple, inartificial manners of those Children of the Desert preferable to the conventional and sometimes inconvenient refinements of European society. In December, 1846, after passing eight months in Caïro on returning from his first excursion among the Arabs, he hired some camels, and set out with a party of Bedowins for the peninsula of Mount Sinai, the Gulf of 'Aḳabah, Kebron, Jerusalem, and across the great Syrian Desert. Near the end of 1847, in the company of a party of Arabs, he visited Túr, hard by the southern extremity of the Arabian Peninsula, and afterwards performed the long and arduous journey to Háil, almost in the heart of the Peninsula. From thence he proceeded northwards to the well-known shrine of 'Alí, about 30 miles west of the Euphrates, which he reached on the 15th of May, 1848.

On arriving at Baghdád, the traveller found that the French merchant, on whom he had letters of credit, was dead; he therefore, having nearly exhausted his funds, set off for Tehrán, where he received a fresh supply from the Russian agent. On his return to the southward, he was compelled by local circumstances to make himself known to Captain Jones, of the Indian Navy, and was by him introduced to Colonel Rawlinson, her Majesty's Consul at Baghdád. The Colonel has acquainted me of his soon finding that, in addition to his extraordinary aptitude for acquiring the Eastern manners and languages, Dr. Wallin possesses no common intimacy with the literal Arabic and many of the best Arab writers.

Struck with the fact that a better acquaintance with the interior of Arabia is still an urgent desideratum, and that in him we had a qualified organ, in respect to age, health, and abilities, your Council empowered me to treat with Dr. Wallin; but the probable expense being beyond our means, Sir Roderick Murchison, at my request, addressed the Grand Duke Constantine, as President of the Imperial Geographical Society of St. Petersburg, expressing a hope of assistance in the undertaking. To this application we have not yet received a reply. Her Majesty's Government and the East India Company have placed the sum of 200*l.* at our disposal, which we are very desirous of devoting to this purpose, together with a loan of proper instruments.

Your second award, Gentlemen, is to Mr. Thomas Brunner, whose expedition to explore the Middle Island of New Zealand was pointedly alluded to in my last Address. His journey through a rugged and wild country was attended with great fatigue and danger; and his narrative of no less than 550 days of exertion is a plain, straightforward statement of what an adventurous man has seen and felt. His resources were very slender, his personal privations exceedingly severe, and his perseverance throughout so long a toil most meritorious.

During this arduous journey, Mr. Brunner obtained an accurate knowledge of about 200 miles of the coast, from Cape Foul-wind to Titihai Headland. He examined a considerable portion of the interior, and satisfied himself of the barren and unprofitable character of

that part of the island ; he traced the courses of several rivers, and discovered more than one extensive lake ; and he has proved that that portion of the western side of Middle Island is unsuitable for colonization. While travelling, all his party fared alike, and each carried his own baggage ; but through all the toils thus encountered—and it is worth particularly noting—he never had occasion to fear the natives, who already are all Wesleyans, and, as far as their poor means went, behaved as Christians.

Such are the grounds on which your Council have awarded the other portion of the Royal donation to Mr. Thomas Brunner.

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A D D R E S S  
TO THE  
ROYAL GEOGRAPHICAL SOCIETY  
OF LONDON;

*Delivered at the Anniversary Meeting on the 26th May, 1851,*

BY CAPT. W. H. SMYTH, R.N., K.S.F., D.C.L., &c.  
PRESIDENT.

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GENTLEMEN,—When I last year had the honour of addressing you from this chair, I ventured to congratulate you upon the elements of stability which I then perceived in the Society, hinting that the depression into which your financial affairs had fallen might be looked for in temporary causes; and the Report which you have just heard will show that we are fairly afloat again. This most desirable state has been owing to your own harmony, to the continued care of your Council, and to the diligence of Dr. Norton Shaw, who, from the unavoidable absence of one of your honorary secretaries, and the melancholy indisposition of the other, has had nearly the whole of the secretarial duties to perform. On that occasion I also alluded to our strong expectation of aid from Government, the utility of our association to the public interests having been substantially laid before them. But I regret to say that as yet we are unconsidered; and were it not for the discriminating kindness of the Principal, the Officers, and the Council of King's College, in admitting us to the use of their apartments, we should have been utterly unable to accommodate the increasing number of persons who attend our evening meetings. The marked favour, however, thus extended to us, is but for the present session; and it will be apparent that for future views the Fellows must cheerfully unite with the President and Council in working as effectively as they possibly can. A Geographical Society might certainly, and with propriety, have found favour in the eye of the Government of a great maritime and commercial country; but it is our part to

deserve success by eschewing despondency. 'I, therefore, call upon you all, and severally, to stand by your colours,—

“ True as the dial to the sun,  
Although it be not shin'd upon.”

OBITUARY.

Still while feelingly conscious that a zealous spirit has recently been excited, which is already actually reaping its reward, it is with sincere concern that I observe how active has been the hand of death in our ranks; for, since the last Anniversary Meeting of this Society, the grave has closed over no fewer than twelve of our Fellows and three of our Honorary Associates. The deceased are :—

Bexley, Lord.

Du Bois de Montpéreux, M.

Du Cane, Captain, R.N.

Harrison, Thomas, Esq.

Lapie, Colonel.

Mawbey, Lieut.-General.

Northampton, Marquis of.

Nugent, Lord.

Peel, Sir Robert.

Ross, Major-Gen. Sir Patrick.

Shadwell, Rt. Hon. Sir Lancelot.

Stanley, Lord, of Alderley.

Stanley, Capt. Owen, R.N.

Stannus, Major-General.

Wahlenberg, Professor.

Lord Bexley, though known to most of you by a gentle and amiable demeanour, played no slight nor unimportant part in the great political arena of his day, having been Chancellor of the Exchequer during a period of great embarrassment to that department. But in Sir Robert Peel there has fallen one who may be justly deemed a leader of the age—a man whose extraordinary abilities have exerted a vast and acknowledged influence over all branches of public affairs, and yet possessed of a mind warmed to the pursuits of philosophy and the fine arts. But my mention of this distinguished statesman must necessarily be confined to his connexion with the scientific bodies in which he took an active and effective interest. He considered that the notice of Government and substantial patronage ought to be extended to the advancement of human knowledge, and illustrated his opinions by acts. Hence his exertions in the cause of the Greenwich Observatory, the British Museum, the Fine Arts' Commission, and other public institutions; and hence his becoming the active trustee of the Ratcliffe Observatory at Oxford, which owed its resuscitation to him and the intelligent M. J. Johnson, who so ably presides over it. Sir Robert was one of the first to suggest the acquisition of the powerful and costly heliometer at that place; and it was but a few days before he met the lamentable casualty which deprived him of life, that I had the

honour of acquainting him with the excellence of the instrument, as proved in measuring the double star  $\gamma$  Virginis. He was one of the very earliest members of this Society; and he took an earnest zeal in establishing the geological branch of the Ordnance Survey of Great Britain, now so efficiently conducted by Sir Henry De la Beche, a distinguished member of your Society.

Lord Nugent was one of those who joined in the first formation of this Society, and, though not himself a practical geographer, was useful in furthering the science, especially while filling the post of Lord High Commissioner of the Ionian Islands. His Lordship was equally well known in the fields of politics and literature, and in private life was remarkable for his uniform suavity of disposition. He died on the 26th of last November, at Lilies, near Aylesbury, of the library of which he had published *Legends*. On the same day we also lost Lieutenant-General Sebright Mawbey, an officer who had served with distinction from the year 1787 to 1815; and during the time he was Assistant Quartermaster-General to the army in Corsica in 1795, was very diligent in collecting plans and maps of that island.

Spencer Joshua Alwyne Compton, Marquis of Northampton, was born in January, 1790, and educated at Trinity College, Cambridge. He became President of the Royal Society in 1838, on the retirement of H.R.H. the Duke of Sussex, and filled that important post till November, 1848, when he resigned it to the Earl of Rosse. He very unexpectedly expired on the 16th of last January, at his seat of Castle Ashby, a few days only after the death of his son-in-law Lord Alford, an event by which he had been deeply afflicted. The noble Lord was a man of varied acquirements, being an accomplished scholar, a proficient in art and literature, a good antiquary, a linguist, a practical geologist, and, without being strictly scientific, an ardent lover of the transcendental branches of human inquiry, which he promoted by every means in his power. Perhaps most of us now present can bear personal testimony to the unvarying and unaffected benevolence of his disposition, the habitual cheerfulness of his temper, and the utter absence from his mind of anything like implacability. Indeed, his expression in a case of my own is well worthy of note among associated bodies:—"Well, Captain Smyth," said he, "I thought you were wrong, and perhaps may think so still; but as your party carried it, my present duty is to do what I can to forward the measure."

In Major-General Sir Patrick Ross the Society has lost a warm and useful friend; for, both in the Mediterranean and in the West Indies, he encouraged directly every inquiry into chorographical details; and

during the time he held the post of Resident at Zante, all travellers into Greece who visited that island were furnished with much useful information; this I can testify from personal experience. Sir Patrick was born in 1778; entered the army in 1794, in the 25th light dragoons; served in various parts of the world till 1821, when he was appointed to the rank of Major-General, and died at St. Helena, on the 28th of last August, being Governor of that island.

Major-General Sir Ephraim Gerish Stannus, C.B., was a gallant soldier of the Bombay army, which service he entered in 1799. At his death he was Governor of the East India Company's Military College at Addiscombe, of which establishment he was a most efficient ruler; and his death is deeply lamented.

The Right Honourable Sir Lancelot Shadwell, Vice-Chancellor of England, will be recollected by some of my auditors, not only for his eminence in the law, and his great general qualifications, but also for his excellent temper, kind disposition, and unvarying gentlemanly behaviour.

The venerable and highly-esteemed Lord Stanley, of Alderley, died in his eighty-fourth year, within a short time of his only brother, the late Bishop of Norwich, whose death we so recently deplored. At the age of twenty-three Lord Stanley freighted a brig of 130 tons, in which, with Mr. Wright as surgeon and botanist, Mr. Baine as mathematician and draughtsman, and Mr. Benners as secretary, he sailed from Leith in May, 1789, to explore the mountains, springs, and extraordinary natural curiosities of Iceland. Diaries of the journeys and researches in the island are preserved in Alderley Park, and it has long been a matter of regret that they have not been published.

But, geographically speaking, the greatest loss suffered by the Society in the past year is that of Captain Owen Stanley, son of the Bishop, in the thirty-ninth year of his age. After passing through the Royal Naval College, this officer embarked on board the 'Druid' frigate, and, having served his noviciate in several ships, was appointed to the 'Adventure,' Captain P. P. King, at Valparaiso, to assist in the exploration of the Straits of Magellan. This was his first initiation as a nautical surveyor; and, in consequence of being placed under the tuition of some of my former officers, he was wont good-humouredly to claim scientific relationship with myself. Having been promoted to the rank of Lieutenant, he was appointed to assist his friend, the present Captain Graves, in the Mediterranean, where he examined the Gulf of Lepanto in a small boat, which he afterwards hauled over the Isthmus of Corinth, and rejoined his ship at Vourlah, after an

absence of eighty-four days. In 1836. he was appointed to the 'Terror,' Captain Sir George Back, on her expedition to the Polar regions in search of Sir John Ross; and on this perilous voyage he had charge of the astronomical and magnetic operations. He was afterwards appointed to the 'Britomart,' in which vessel he aided in forming the colony of Port Essington, and made a track survey of the Arafura Sea, with other work. He became a Captain in September, 1844, and in 1846 was appointed to command the 'Rattlesnake,' a small frigate, expressly fitted for carrying on a survey in the Indian and Australian Seas.

Captain Stanley's hydrographical labours in this ship may be thus summed up:—A survey of Simon's Bay, Cape of Good Hope, on a large scale; plans of Two-fold and Botany Bays, on the E. coast of Australia; a plan of the entrance of Port Jackson, to show how far that harbour is available for the largest class of ships of war; a plan of Port Curtis and the entrance to Moreton Bay; and eleven sheets of the N.E. coast of Australia, from Rockingham Bay to Jervis Island, marking the inner route between the Barrier Reefs and the main land. He also re-examined eight channels through Torres Straits, five of which were previously unknown, and protracted them on a scale of half an inch to the mile of latitude. Of his last work, the Louisiade Archipelago, you are acquainted by the letter so recently read at one of your evening meetings, on which occasion an abstract of the natural history of portions of those countries was given by Mr. Mac Gillivray, who acted as naturalist to the expedition.

Captain Stanley in this charge, as indeed he had always done, devoted his whole time and energy to the fulfilment of the duties entrusted to him by the Lords Commissioners of the Admiralty; and he was fond of scientific pursuits generally, beyond the usual acquirements of an ordinary nautical surveyor—a class of which he proved himself, by his works, so able and distinguished an example. His health had been declining under the fatigues and anxieties attendant upon the arduous labour of surveying in inter-tropical climates, among coral-reefs, strange currents, and many physical and moral evils; and he had complained of illness on his passage from the Louisiade Islands to Port Jackson. At Cape York he first heard of the death of his brother, Captain C. E. Stanley, of the Royal Engineers; and on his arrival in Sydney he was informed of the decease of his father, the tidings of which were conveyed by his former commander, Captain P. P. King. These bereavements preyed upon his mind, and, acting upon a system already much debilitated, had a fatal determination,



and brought his valuable life to a sudden close on the 13th of March, 1850. His remains rest in the cemetery at Sydney, wherein he was interred with ceremonials due to his rank, and expressive of the great esteem in which he was held.

Such are the losses we have sustained among our Fellows: nor has the "Fell Serjeant" spared our Honorary list. Among those who have fallen, Colonel Pierre Lapie, of Paris, was a very useful practical geographer, from whose hand has issued a multitude of creditable maps. I had no personal acquaintance or correspondence with him; but, from his public communications and the general merit of his maps, his value as an industrious compiler is manifest. Still it must be acknowledged that he was not always happy in his authorities.

Göran Wahlenberg, Professor in the University of Upsala, and so celebrated by his valuable botanical works, is stated to have spent thirty out of a life of seventy-one years in scientific journeys in Sweden, Norway, Germany, and indeed throughout the different countries of Europe; and the results of these travels were given in a variety of learned publications, among which his well-known Atlas may be specially instanced. He was born in October, 1780, in the Swedish province of Wermeland, and taught at Upsala, a benefit for which he gratefully left to that University his collections and library. He was one of the very first foreigners named as an Associate after the formation of this Society.

Frederic Du Bois de Montpéreux was a native of Switzerland, and in early life was a teacher of the young, the tediousness of which laborious occupation he relieved by a course of sound and scientific studies. About the year 1830, having become the tutor of a young Polish noble, he passed some time in travelling with him over various parts of Germany, Denmark, and Sweden, during which he carefully attended to the geology, antiquities, and ethnology of those countries. Having realized what he deemed a sufficient sum, he set out alone, in the spring of 1832, to explore the Crimea, Caucasus, and the adjacent districts, whence he returned, after four years of difficulty and danger. He was appointed Professor of Archæology in the University of Neuchâtel, near the place of his birth; but his health was undermined by the bodily fatigue and privations he had undergone, and he died under a broken constitution on the 7th of last May, at the age of fifty-two years. He became one of our honorary members in 1844.

#### OUR OWN "LABOURS."

Agreeably to the form usually observed, I shall now allude to what

is designated our own "labours," as applied to the transactions in these apartments. The year now ended has been one of material concern to our interests as a body, inasmuch as the number of persons who attended our Evening Meetings increased so largely that the want of sufficient room for their accommodation was seriously felt. The prospect of aid from the Government still flitted before us; but finding our wants increasing under promise delayed, after gathering the opinions of two or three intelligent friends, I proposed that our Council should apply to the Authorities of King's College for the indulgence which we are now enjoying.

In the mean time our Meetings passed harmoniously and instructively, and were attended by visitors of the highest rank in the intellectual circles. Our library and map establishment have been enriched by numerous presents of importance and value; and our stock of instruments is augmented by the munificent bequest of Mr. Shedden, as stated in your Council's Report. Among other gifts, we should mention the fine series of maps and charts prepared by the Topographical Corps of Vienna for the great Exhibition in Hyde Park, and presented to us by the Austrian Government: nor should the maps of the Royal Society of Northern Antiquaries at Copenhagen, forwarded by Professor Rafn, and the physico-geographical maps executed by the Crown Prince of Sweden, exhibited to us by Count Rosen, be omitted.

The papers read at these Meetings were communicated by Fellows and zealous travellers from all parts of the globe; and as they consequently relate to its various and particular quarters, I shall take the liberty of citing some of them in connexion with those parts in detail. I will therefore at present only express how greatly we have been indebted to the contributors of those documents for the information given, as well as to those gentlemen who favoured us with the results of their actual knowledge—derived either from experience or well-directed inquiry—in the interesting discussions which followed the several readings. These evenings have indeed greatly gratified me, in the obvious proof they have afforded of our possessing steady friends who take a permanent concern in the advancement of the objects and in the continued prosperity of the Society.

Those communications which relate to the important consideration of the instruments essentially requisite for scientific travellers, are of paramount interest to a Society of Geographers: and in this light we may class two which were received in the past year; since, however open to practical objections, they are very likely to lead to useful investigation, and consequent valuable results in the instrumental

means of measuring the heights of mountains. This has been effected with great exactitude by means of the simple yet powerful Torricellian Tube; and the only objection ever yet made to its use, has been its difficulty of transport among abrupt heights. In probing the revelations of science, it is advantageous for general argument, to assume certain conditions as being undeniably, if not absolutely true. Now the mean pressure exerted upon the surface of the earth by the atmosphere, as indicated by the barometer, equals a column of mercury 30 inches high; that is, the column of air pressing upon the open end of a bent tube filled with quicksilver, exactly balances that quantity, which represents a pressure of 15 lbs. upon every square inch of surface. Here then is a natural scale for ascertaining the pressure; which pressure is a compound of the weight of the gaseous envelope, and the elastic force of the aqueous vapour contained in it. Various contrivances have been from time to time suggested, but no faith can be reposed in any other method except the expensive ones of triangulation and levelling. My own recorded trial of ascertaining the height of Mount Etha in 1814, by means of boiling water and a very sensitive thermometer, was but an experiment.

The first of the communications alluded to was intituled 'Remarks on the Use of the Aneroid Barometer,' by Colonel Yorke, late of the Scotch Fusilier Guards, and now your Honorary Secretary; who, during a journey upon the Continent last summer, gave that instrument a very fair comparison with an ordinary barometer under different circumstances and at different heights, the whole of which he has placed before the Society in a tabulated form. From the result of these operations, Colonel Yorke is led to conclude this instrument may be used satisfactorily when sudden changes of atmospheric pressure are desired to be shown; also to determine differences of level, when it can be compared before and after the observations, and within 24 hours, with a good ordinary fixed barometer. The aneroid should, previously to being used, be carefully tried with the barometer, at low pressures under an air-pump; and when in use, should always be observed in the same position.

The second paper on the subject was from Dr. Buist, of Bombay, F.R.S. This gentleman has entered fully into the construction and use of the Aneroid Barometer, and carefully compared it both with the Torricellian tube and the Mountain Sympiesometer. Among other remarks on the Aneroid's performance, Dr. Buist says, in summing up, "Should Mr. Adie's surmise prove correct, and the Aneroid at pressures under 28 inches cease, as at present cut, to harmonize with the

barometer, it would be well, with an instrument so compact and convenient, to see whether a series of Aneroids could not be so made as to serve in succession for any ordinary elevation; or whether the portions of the scale lower than those on the common Aneroid might not be so altered as to afford the correct pressure. One instrument might serve for the first 2000 feet, a second when only marked up to 28 inches might carry us 2000 feet higher, and so on. The matter might be very easily determined under the receiver of an air-pump, without actual ascent, the barometric gauge with a good scale answering as well as the barometer itself."

Now it must be remembered, that after the first introduction of this misnomered instrument at the Swansea Meeting of the British Association, in 1848, it was so successfully advertised as a perfect means both for meteorological observations and for obtaining differences of level, that many travellers, captivated by its ingenuity of principle and handiness of structure, together with its portability and facility of observing, were induced at once to substitute it for the mercurial barometer. On an examination of the instrument, however, it struck me that these assumptions were too hasty; for, notwithstanding its being so beautifully compact, and its capability for showing average differences, I could not but consider its complexity as an obstacle where a traveller could obtain neither workmen nor comparison, so that injury would be irreparable, and errors might remain without detection. A trial which was made with a friend, Mr. A. K. Barclay, on Leith Hill in Surrey, which is 993 feet in height, was satisfactory; but then we had a standard barometer to refer to both before and after the operation. Further inquiry showed me that ulterior improvement is wanting before the Aneroid can be trusted otherwise than as a journeyman to the Torricellian tube, in the manner of a job-watch to a box-chronometer. But still, if it will only serve for heights of 3000 feet, its use as a travelling instrument is very limited indeed; and we have just seen the adjustment for fresh starts proposed by Dr. Buist. When the atmosphere becomes more rarefied than the gas contained in the cylinder, its corrugated surface dilates to its full extent, and ceases to exercise any influence upon the levers and index of the dial plate; so that the latter is liable to become stationary at an elevation of between 3000 and 4000 feet. Hence the indications are very anomalous in extreme cases, the very ones in which a traveller would have most need to use it, namely, in measuring mountains, not hills. Other objections may apply to the moveable index and the perishable materials used within the case, while the scale is nothing fixed in nature, and can never

be treated *per se*; nor can either the zero point of the scale, nor even the value of it, remain constant.

I therefore consider it a duty to remind you, that as the machine depends altogether on the accuracy of the experimental trials of the workmen, which you have no hold over, no Aneroid observations can be absolutely depended on, and therefore cannot be used for any scientific purpose, unless the particular instrument has been tested by comparison with a barometer at three different and distant parts of the scale, before and after the observations.

#### EUROPE.

Although Europe has been so well trodden that few actual or exciting geographical discoveries are to be expected, still the exertions of science are constantly directed towards investigating the substantial elements of its state, and accurately ascertaining the surface, so as to rectify the chorography of its various countries.

Regarding the coast survey of the British Islands, it is perhaps only necessary to say that it is progressing with regularity and precision. Our naval surveyors, under the directions of the Lords Commissioners of the Admiralty, are pursuing their labours with their usual energy; adding every year to our correct knowledge of Hydrography, as well as of her parent Geography. At home, the South and East coasts of England are undergoing a rigid examination by Captains Bullock, Sheringham, and Williams; those of Ireland by Frazer, Church, Bedford, and R. Beechey; and those of Scotland by Robinson, Otter, and Thomas. Captain Frederick Beechey is pursuing his valuable investigation of the laws which govern the tides of the North Sea, in continuation of his previous observations of those in the Channel, and is now about to communicate some unexpected results to the Royal Society. And especial mention should be made of a magnificent chart of the Tyne to above Shields and Newcastle, on a scale of 27 inches to the mile, and 36 feet in length, which has just been completed by Mr. Calver, one of the most active of our hydrographic force, who has now undertaken the survey of the Humber from the sea to Hull, and from Hull to Goole. Here I cannot but advert to one of the great benefits of our present system of minute and accurate surveying—that it shows the growth, change, or removal of deposits of sand or silt in our harbours, thus becoming the only trustworthy evidence to which either the Government or Parliament can appeal from the contradictory statements of interested parties.

Such is the steady but unpretending progress of our home surveyors:

abroad they are no less zealously occupied. Captain Bayfield's important survey of the St. Lawrence, which commenced thirty years ago with the remote waters of Lake Superior, came down along the shores of that noble river and embraced the whole circuit of the Gulf; and he is now completing his gigantic task by the survey of Breton Island, with all its unparalleled inlets and water communications. In the same quarter of the world Commander Shortland has undertaken the completion of the Gulf of Fundy, which was so successfully begun by that veteran surveyor, Rear-Admiral W. F. Owen. In the West Indies, the coasts of Central America having been already executed, the great chains of the Antilles and Caribbee Islands are the interesting field of Lieutenant Lawrence's unremitting labours. Commander Spratt has just been dispatched to complete the coasts of Candia, which the Society will regret were not allowed to be finished by the indefatigable Captain Graves, in order to crown his long and arduous services in the Archipelago; nor will the regret subside on learning that his ship was taken from him, to the hurtful interruption of his valuable work, on the plea of economy.

Of the Australian Seas, the truly devoted exertions of the late Captain Stanley have given to us, in the Southern Coast of New Guinea, a gratifying conviction that the Admiralty having thus broken ground in the Pacific, will steadily advance from group to group till its islands possess a somewhat less chaotic appearance in our charts. Captain Lort Stokes—from whom we received a description of the southern shores of the Middle Island—having already worn out his vessel, the 'Acheron,' in examining the distant but little known shores of New Zealand, Captain Drury has been directed to carry on that now most necessary survey to its completion; and lastly, in the East Indies, the 'Royalist,' under Commander Bate, is exploring the forest of insulated rocks which are such a remarkable feature in the China Sea.\* He is also adding to our charts the dangers and the resources of Palawan Island, a free passage round the eastern shores of which will occasionally save our China-bound vessels much time and much risk. While the views of the Lords of the Admiralty are thus directly contributing to our stores of hydro-geographical knowledge, the several expeditions which, from humane and not less enlightened motives, they have sent to the rescue of our long absent countrymen with Sir John Franklin, cannot fail to add indirectly to our knowledge of those sterile

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\* China Sea is a barbarism, grammatically indefensible, but so completely established by long usage that we cannot get rid of it. If navigators had thought of what an appearance *England Sea* or *France Sea* would make in their logs, they would never have sunk in the gulf of China Sea.

Arctic regions, which probably would otherwise have for ever remained unvisited. Already has Captain Kellett made some discoveries in Behring Strait; and even Commander Pullen, in his miserable boats, had added some islands to the American shore of the Polar Sea.

It will be obvious that this accumulation of accurate information must be eminently useful for future ages, and to all nations; while the promptness of publication adopted by Admiral Sir Francis Beaufort is worthy of imitation, in every country where extensive surveys are undertaken.

Respecting our great Ordnance Survey, I regret to say that our present information is neither so immediate nor so precise as when it was under the able conduct of General Colby, one of the first members of this Society, an officer who was in the habit of earnestly consulting the wants and wishes of the science. It is true that we have no reason to complain of any particular discourtesy at head-quarters, but the communications of late have borne rather on the actual results of the operations than on the methods adopted or progress made. Thus we learn that the Board is still engraving and publishing the maps of the northern counties; and that its surveyors have broken ground in Scotland, the final topographical examination of which is expected to yield results of great interest in various branches of inquiry.

The Geological Survey of England has considerably advanced during the past year, notwithstanding no more sheets have been published since I last addressed you; but the whole of North Wales has been completed, and the last sheets (77 and 78) are in the engraver's hands, while numerous illustrative sections have been preparing. Of the important mineral districts in Central England the maps are in a great state of forwardness, although not quite ready for actual publication. The Staffordshire coal-field, in sheet 62, is nearly completed; and of the Derbyshire mining district, 81, N.E. and S.E. are on the plates, and the other sheets are in such an advanced state, that they will probably be published during the summer. This portion of the survey, including parts of Warwickshire, Staffordshire, and Derbyshire, will assuredly throw a very important light on the mutual relations of our coal-fields, and on the probability of making valuable discoveries beyond their supposed limits, and over areas where the surface is occupied by later formations. In the Peak of Derbyshire the *tract* of the very numerous lead-veins has been most carefully given for the first time, since, although they have been the scene of important mining operations from the time of the Romans to the present day, the peculiar mineral laws of that tract of country, and the consequent minute

subdivision of the mining ground in the metalliferous districts, have hitherto prevented our obtaining a general view of the subject. In Ireland the county of Wexford has been published, and Dublin is now ready, though unfortunately on a small and unsatisfactory scale; added to which, the arbitrary and unphilosophical division by counties, is an obstacle to the appreciation of physical facts.

Such have been the labours of our public departments in the past year; nor have our other practical geographers been resting on their oars. Mr. Arrowsmith has constructed the Isthmus of Darien, from the surveys of Belcher, Kellett, Wood, Barnet, Fidalgo, Lloyd, Hughes, Garella, and other authorities, on an elephant sheet. He has likewise engraved on a similar sheet the Eastern Frontier of the Cape Colony and part of Kafir-land, and a map of the district of Natal. He has also published a single-sheet map of the Mining District of California, from the surveys of Captain W. A. Jackson, with letter-press accompaniment. Mr. Trelawney Saunders has continued his attention to the regions of Central America; and, among other publications, I cannot but call your attention to the elaborate physical maps of the British Isles, drawn up by Mr. Petermann, and indicating the peculiar features of the surface, the seats of industry, the agricultural and mining districts, the population, and the temperature and rain. I must also specially note a set of physical maps of the world, by the same gentleman, beautifully engraved on stone, and sold at the price of a penny; which from their small price and intrinsic value cannot but render them extensively available for the purposes of education. Mr. Petermann has likewise drawn and engraved a map of Borneo for the Borneo Church Mission, which gives the fruits of the surveys of Belcher, Gordon, and Mundy, together with the recent Dutch explorations in the interior; moreover it possesses peculiar claims on our attention as essentially modifying our hitherto conceived notions of the shape of this immense island, which will one day bear no unimportant part in the affairs of the East. Another attempt to supply the public with maps of tolerable accuracy at a very cheap rate should be noticed; I allude to the Atlas of Penny Maps engraved by Mr. Joseph Wilson Lowry, one of your Fellows, and now publishing by Chapman and Hall, specimens of which have been placed before you. These maps are all drawn according to a particular system of scale and proportion; and in the coloured ones, each scale is distinctly indicated by a different colour. The impressions are taken by surface-printing from blocks electrotyped from the original plates, a process termed Glyphography, the work standing up in relief. Although the prints by this method



have not the delicacy of a copper or steel engraving, correctness is not impaired by it; while the cheapness of surface-printing places good maps within the reach of the humbler classes.

A bold attempt to impart geographical knowledge to the million has been made by another of our Fellows, Mr. James Wyld, M.P., in the construction of the gigantic globe now fitting up in Leicester Square; an effort at once onerous, toilsome, ingenious, and expensive. This colossal figure of the earth is modelled on a scale of 10 geographical miles to an inch horizontal, or 6 inches to a degree; and it is 1 mile to an inch vertical, while the diameter is no less than 65 feet. Visitors will pass into the interior of this huge ball, and by means of a gradual ascent to successive stages, will view every part of the vast model from a very moderate distance. Mr. Wyld was good enough to show and explain to me the whole of his undertaking; and though the work was not then sufficiently advanced for minute criticism, I confess being both surprised and pleased on the whole. It is made up of some thousands of raised blocks, or castings in plaster from the original models of mountain and valley, sea and river, in clay, the fitting of which has been one of the principal difficulties which the constructor has had to encounter. Recollecting that only a limited part of a sphere can meet the eye at once, it occurred to Mr. Wyld that by figuring the earth's surface on the interior, instead of the exterior of his globe, the observer would be enabled to embrace the distribution of land and water, with the physical features of the globe, at one view: and in this he has in substance succeeded; while, from the great size, the examiner of details is hardly aware that he is gazing on a concavity. The attempt is well worthy of the projector and the spirit of the age.

The great geographical works to which I alluded last year have been issuing periodically from the press, and as yet realize their professions. The several parts have been placed on your table as soon as published. Of Knight's '*Imperial Cyclopædia*,' the first six parts of the *Geography of the British Empire—A to D*—are completed; and it is embellished with maps and views, principally of churches and public buildings. Of Fullarton's '*Gazetteer of the World*' the two first volumes are placed in your library, where they have been examined by many of our members: they comprise the names of places alphabetically from A to D, and are illustrated with very beautiful engravings of chorographical maps, plans, and views. The '*General Gazetteer*' of Messrs. Blackie has made a similar advance, and the number of its names will be nearly doubled, although the compilers do not intend to make its claim to public approval altogether dependent

upon so uncertain a test, as the numerical strength of names in its alphabet.

Colonel Jackson, your late secretary, has recently translated a very useful work, the 'Military Topography of Continental Europe,' by M. Lavallée, wherein the surface features, slopes and basins of Europe, with the rivers and their affluents, are ably set forth. The Colonel has also published an excellent manual on Military Geography, showing its nature, object, and importance. But among the various publications of merit and interest to our pursuit, let me not forget a small periodical, the 'Church Missionary Register,' a monthly journal which commenced two years ago, and has been presented to your library. This well-conducted work, although mainly directed to the higher destinies of man, diffuses a large fund of important geographical information, as well as striking views into the manners and habits of many tribes.

In France the recent march of geography has been more useful than brilliant, and exertions have been made rather to open new outlets for commerce than to seek fresh discoveries. The publication of several books of travels, printed at the expense or with the assistance of Government, has been continued, as well as the 'Voyage dans le Nord' by Gaimard, and the 'Voyage de la Bonite,' while those of MM. Galinier and Ferret in Abyssinia are now on the point of being completed. The narrative of a residence in the capital of Thibet by M. Huc, a Lazarist missionary, contains some corroborative details respecting a country imperfectly known to Europeans. Three volumes of M. de Castelnau's Travels have appeared, embracing his journey from the coast of Brazil to the Bolivian frontier. An English naturalist who accompanied him, Dr. Weddell, is the author of a supplementary volume, which embraces the southern provinces of Bolivia, and describes the celebrated deposits of fossil bones in that region, with many botanical and other details.

The Dépôt de la Guerre has published several new sheets of its large military map of France during the past year, and considerable progress has been made of the same map on a reduced scale  $\frac{1}{1,000,000}$ , a portion of which will be published this year. The survey of the departments not yet completed has also made considerable progress under the able direction of the newly appointed chief of the topographers, Colonel Peytier. A map of Greece in 12 sheets, commenced many years ago, is now nearly completed, and will prove a great boon to geographers and travellers. The French hydrographical department has been principally engaged during the past year in publishing materials which have been long accumulating in its archives. No new surveys have

been undertaken ; but our friend Mr. Pentland understands that it is the intention of the Minister of Marine to resume the surveys of the west coast of Italy and the north coast of Africa, interrupted by the troublous events of 1848. Mr. Pentland brought over a couple of sheets of the southern coast of France, which are beautiful specimens of topographical engraving. The 'Annales Hydrographiques,' a work published by the aforesaid Dépôt, contains an account of their publications as regarding charts, plans, and nautical instructions.

At Brussels the veteran M. Joachim Lelewel is continuing his researches into the geography of the middle ages, of which he has recently published the Atlas of the early epochs ; and it is well that sources of chartography should be studied, since the progress of commerce and navigation is so intimately connected with the great events of the world. But this is not all, for those who consult only the newest maps can but reap that information which the particular compiler may happen to give. You will recollect the vellum Portulano of 1547, which Sir Thomas Phillipps, at my request, exhibited to you ; a curious volume, representing the Spanish and Portuguese discoveries in the old and new worlds. In this the dangerous reef of the Skerki are well placed, rocks which afterwards disappeared from most of the charts ; and the disbelief of their existence occasioned the loss of a 64-gun ship, the 'Athénien,' and 351 of her crew, so lately as 1804. Among other matters the sources of the Nile are carried in that manuscript to a mountainous country, south of the equator, and two inland lakes seem to indicate the recent discoveries. The exploits of Sir Thomas Candish between California and Panamá are not very clearly traceable on modern charts ; but in a M.S. Derrotero of the South Sea, belonging to the Society of Antiquaries, there is a bay near the Ensenada de Nicoya, and between it and Panamá, in which is written "En esta ensenada dio carena a su não Thomas Candi Yngles qr entro por el estrecho de Magellanes año de 1587." Now this cove, sheltered by the Ysla del Caño, was not known as a heaving-down place in 1790. This curious volume was drawn up in Panamá in 1669, and dedicated to the Sovereign Queen of Angels and Men, Maria, Madre de Dios. In the gulf before that city a shoal is marked between the Pearl Islands and the main, called S. Josef, against which is written, "En este baso se perdio la Almiranta del Rey año de 1631 ;" yet Dampier, notwithstanding his adventures near the spot, does not seem to have been aware of his proximity to danger. The subject however is well broached, for Cardinal Zurla, Viscount Santarem, and M. Jomard have been doing

for the geography of the middle ages what Major Rennell and M. Goselin did for the classical era.

The southern states of Europe have not exhibited a remarkable animation either in geographical publications or surveys, and the principal feature of the year is perhaps the Physical Geography of the Alps ('*Untersuchungen über die Physicalische Geographie der Alpen*') by the brothers Hermann and Adolph Schlagintweit of Bavaria, who were so recently our visitors. This very important work is divided into four principal parts, the Glaciers, the Geology, the Meteorology, and the Botany of that mountain chain, each of which is treated in a masterly manner, and not the least valuable portion is the measurement of the heights of the various summits.

Germany, as usual, has displayed an eminent industry in the cause of geography, whether in publications, travels, or scientific inquiries. Professor Ritter has published the first portion of his '*Geography of Palestine*,' which forms the 15th part of his '*Erdkunde von Asien*,' a work which promises to be the most comprehensive and—if not too much hurried—complete which has yet been published on that country. Professor Berghaus has completed the divisions of his Physical Atlas to which I alluded last year, and has also published the second volume of his '*Geographische Jahrbücher*,' which contains a luminous résumé of the chorography of Africa, rendered particularly valuable by the full bibliographical notes and quotations. Baron de Wrede, whose interesting excursion in Hadramaut, in south-eastern Arabia, is printed in your Journal, is about to publish the results of his '*Sixteen Years of Travels in the East*.'

The most important of the maps published in Germany during the last year, and presented to us, is Professor Koch's examination of Mount Caucasus; it is on four sheets, and beautifully executed to a scale of 1,000,000. This enterprising traveller spent many years in exploring Asia Minor and the Caucasian countries, and has made extensive researches and surveys, which, together with the Russian Government operations, form the basis of the map. It is a very complete compilation, and is coloured politically, ethnographically, botanically, and geologically. Major-General Oberreit of Dresden has forwarded the 3rd part of the '*Atlas of Saxony*' for our library, and from the *Etat-major* at Munich we have received sections of the '*Topographical Atlas*' of the Kingdom of Bavaria. The munificent gift from Austria of the collection of important geographical works to be first shown at the World's Exhibition has been already

mentioned to you; and Lieutenant-General Skribaneck enumerates among the labours of the year at the Institute of Vienna parts of the special map of Bohemia on a scale of  $\frac{1}{144,000}$ , a map of Italy in 27 large sheets on a scale of  $\frac{1}{144,000}$ , and other similar works. Of the Prussian Government-survey, sections 35 to 38 of the Map of the Province of Brandenburg, and sections 49, 50, and 51 of that of Westphalia, have been published.

The scientific exertions of Denmark have been somewhat retarded by recent political events; and enterprise will be further damped by the death of Professor Schumacher, a man of rare mathematical and philological acquirements and unwearied application to business. Besides establishing that cosmopolitan bond of scientific union, the 'Astronomische Nachrichten,' it will be recollected that he superintended the measurement of the Danish arc of the meridian, and made various chronometric journeys for the express purpose of fixing longitudes.

The 'Topographical Survey of Sweden'—which is to consist of 260 sheets—is advancing rapidly, and much interest has been excited by the continuation of Struve's Grand Arc through Norwegian Lapland to the North Cape, the Swedish portion being undertaken by Professor Selander of Stockholm, and the Norwegian under the direction of Professor Hansteen of Christiania. Lieutenant Kloumann and the gentlemen who were sent to measure the base near Aetenfjord, in Finmark, had many obstacles to contend with from the excessive rigour of the climate, among glaciers and on steppes several thousand feet above the level of the sea; but every difficulty was zealously encountered, and the whole work is probably now done. A chronometric expedition has been employed in ascertaining the difference of longitude between the observatories of Christiania and Copenhagen, and various chartographic works have appeared both in Sweden and Norway. The maps constructed by the Crown Prince, Carl Ludwig Eugène, lately exhibited before us, were replete with physical information respecting the districts represented, but more especially the water, mineral, and forest features; and our Society pointedly marked its approbation by immediately electing his Royal Highness an Honorary member.

Professor Nilsson has sent Dr. Thurman's letter on northern antiquities ethnologically considered, together with a learned disquisition on the changes of surface which Scandinavia has undergone in later times, for a clear translation of both of which from the Swedish language I am indebted to Dr. Shaw; and General Carl Akrell of Stockholm has written a memorandum of the geographical works that have lately appeared in Sweden. Of these the principal seem to be a new edition

of Tuneld's 'Geography of the Kingdom,' in 8 volumes; the Statistics of the same by the late Colonel Forsell, an Atlas of Sweden by Baron Hermelin, and the Maritime Atlas of the late Admiral Klint. Some operations are also in hand between Torneo and Alten for the future solution of the question as to whether the surface of Sweden is rising or the waters of the Gulf of Bothnia are receding.

Although my Russian correspondents have not been altogether so alert as could have been desired, we have received indications of their recent geographical progress; and the first volume of the Memoranda of the Geographical Society of St. Petersburg has been placed on our table. It is well known to you that the survey of this vast empire has long been in hand, that much is achieved, and that much still remains to be done; and the grasp of the undertaking may be estimated when we recollect that the intermediate space between the Baltic and Black Seas comprehends twenty-one large provinces, on which the Imperial Staff has been employed trigonometrically, on an unprecedented scale, for the last thirty years; yet this is not above one quarter of Russia in Europe! In the course of operations carried on by different parties, with different instruments, and perhaps using different methods, difficulties would occur in the ultimate arrangements; and the necessity of measuring an arc of the meridian—the only true foundation of geographical and absolute accuracy—became obvious. Under the management of my able friend, the elder Struve, this crucial operation was commenced on the banks of the Dūna, in the year 1820, whence it gradually increased in length, till, in 1845, it extended southwards to Ismail, near the Black Sea, and northwards to Torneo, at the head of the Gulf of Bothnia—the whole forming the unprecedented measurement of an arc of more than  $20^{\circ}$  in length. Struve, however, was not yet content; for he then proposed to the Swedish Government that, with their co-operation, the line should be carried to the Polar Sea,  $4\frac{1}{2}^{\circ}$  further. The measurement is now finished, but I believe the observations are not yet worked out.

There are, gentlemen, as is known to you all, two great objects for which the regular trigonometrical survey of a country is undertaken. The first of these is the correct ascertainment of the exact co-ordinates for placing the various stations relatively to each other, and to the equator as well as meridians of the terrestrial spheroid, for the purpose of forming an accurate map: the second is to determine the dimensions and form of the earth, by ascertaining the curvature of a given portion of its surface. This determination is a problem of the greatest importance in astronomy and geography, as well as of high general interest

and curiosity. The irregular figure of our globe is the cause that the geodetic meridian is not a regular curve; and although theoretically it may be viewed as one of the series of consequences resulting from the gravitation of matter, geographically considered, it is a fact to be determined by actual measurement. Mr. Maclear's repetition and extension of La Caille's arc in Caffraria, with better means and more time, has ignored the supposition, so long entertained, that La Caille had detected a sensible difference in the shape of the earth in the two hemispheres.

The Emperor of Russia aided the Imperial Geographical Society in the expense of sending an expedition to the Ural Mountains. It set out last June; and, though troubled by the differences of dialect among the Samoyedes, Ostiaks, and other native tribes of the places passed through, explored the high and arid chain lying between  $64^{\circ} 30'$  and  $65^{\circ} 30' N$ . The passage of the Sarti, 2000 feet above the sea, was extremely difficult. Colonel Hofmann also, one of our Honorary Members, having published his travels in Eastern Siberia, visited the southern Ural; and his excursion is full of geographical interest respecting the aspect of those regions, the auriferous veins, and the vast primeval forests which cover the flanks of the Sayan Mountains.

Prince Emanuel Galitzin has announced that a remarkable group of islands has been discovered in the Sea of Aral, which were hitherto unknown; they were seen and visited by M. Boutacheff, an officer employed in the 'Constantine' on a survey of that sea. The Prince also mentions that M. P. de Krusenstern, son of the celebrated Admiral of that name, has begun the exploration of Nova Zembla: he will continue it this year, and at his return we have reason to hope for much information respecting this remote island.

An important work was published at the commencement of this year, by the Ministry of State Domains in St. Petersburg; it is intitled 'The Agronomical and Statistical Atlas of European Russia;' and a copy has been presented to us by Baron Brunnow, with a translation of the explanatory notes by Count Wielhorsky. The plates are elaborately compiled and carefully coloured; and they treat of the geology, climate, population, agriculture, flocks and herds, average cereal crops, forests, and distribution of the cultivated and uncultivated districts.

Sir Walter Trevelyan, of this Society, tells us of Mr. Lundt's having informed him that he last year visited the coast of Greenland, from the 61st to the 72nd degree of N. latitude; that he discovered, and has brought to England, specimens of rich ores of plumbago, galena, ironstone, cryolite, and sulphuret of copper, containing from

66 to 70 per cent. of metal; and that he found abundance of coal in latitude 72°. But the site of his travels recalls a topic which retains its painful interest and mysterious uncertainty unbroken; and it is a severe disappointment not to be enabled to congratulate the Society on the rescue of its gallant member, Sir John Franklin, and his meritorious companions, from their long imprisonment in the Arctic regions.

On this occasion last year I had the pleasure of stating that measures of a most comprehensive nature were about to be taken for exploring those portions of the icy seas where it was supposed the missing ships might be found; and it was not unreasonable to hope that where so many hands were held out to save, one at least might prove successful. But, although no immediate tidings of our unfortunate friends have reached us, the labours of the searching squadron last year were not altogether fruitless; for, by the unexpected return of the 'Prince Albert,' which you will remember was dispatched by Lady Franklin to search Regent's Inlet, but was prevented by heavy ice, we are put into possession of facts which destroy the supposition that the 'Erebus' and 'Terror' foundered in Baffin's Bay. Traces of an encampment, and relics of the visit of a party, were found on Cape Riley, at the S.E. entrance of Wellington Channel; and, from the investigations which were made, it is almost conclusive that the vestiges are those of a party who were landed on the Cape for the purpose of making magnetical observations.

As the searching ships, and those sent out by the United States, may be supposed, from the aspect of affairs when the 'Prince Albert' returned, to have succeeded in making a considerable westing before the setting in of winter, we are not unwarranted in hoping that they have fallen in with the objects of their toils, or at least have discovered more definite traces of them. And it is most gratifying to find that the Russian authorities have given orders to place boats and men at our service along the coast of Eastern Asia; and every facility will be afforded to our officers in the prosecution of their inquiries through the Russian dominions.

The expedition through Behring's Strait had not been successful when last heard of. Captain Collinson, having been baffled by ice, deemed it prudent to winter at Hong Kong; but Captain M'Clure, with better fortune, had conducted his ship through the Strait, and was pushing on in the direction of Banks's Land. Now, unless the Arctic seas should be more than usually ice-bound, we may confidently look forward to the return of one or more of the searching ships in the ensuing autumn. I cannot forbear, however, warning the Society



against such absurd and cruel reports as have already been foisted upon them. Captain Kellett, who has been so much engaged in Behring's Strait, declares that the coast "is alive" with stories respecting the absent crews; and that "the Esquimaux are ever ready to exercise their ingenuity by inventing a story."

Animated by an energy which circumstances have rendered nearly desperate, Lady Franklin has, from her own private resources, again dispatched the 'Prince Albert' to Regent's Inlet, to carry into effect what the ice prevented from being done last year. The command has been confided to Mr. Kennedy, formerly in the service of the Hudson's Bay Company; and among the crew, who have volunteered to go, is Hepburn, who served under Sir John in his memorable land journey, and has been restlessly eager to proceed in quest of his former chief.

*Gaudet tentamine virtus!*

#### ASIA.

This vast and wondrous quarter of the globe, once renowned for arts and learning, and perhaps the very cradle of civilization, had subsequently been for ages all but unknown; yet was that region of the gravest interest to the rest of the world, whether viewed in an historical, chorographical, ethnological, or commercial light. Of late years our knowledge has been much enlarged through the liberality of the East India Government and the untiring efforts of a numerous corps of zealous and efficient explorators: much, however, still remains to be done, and we have heard both complaints and regrets that the surveys of Western India, which might have been published twenty years ago, should have been so long in hand, as well as that the numerous statistical documents collected by the surveyors have been withheld from the public.

The grand trigonometrical survey of India continues to proceed satisfactorily, under the able superintendence of Lieutenant-Colonel Waugh, the Surveyor-General. According to the last Report, the Punjáb series has been extended beyond the meridian of Lahore, towards Peshawar, near which it is proposed to measure a base of verification. Another longitudinal series is in progress, under Captain Renny Tailyour, from the base near Seroor, towards Kurrachee, where another line of verification will be measured. The party has already reached the borders of the Great Desert. A third band of surveyors has been formed to branch off from the last-named, and triangulate Gujerat and Kattiwar. The geodesy of the Bombay Presidency has been connected with Captain Tailyour's work, and the topographical

surveys advance simultaneously with the trigonometrical operations. The south coast triangles, which are intended to connect those of the Madras Presidency with the Calcutta base, proceed but slowly, owing to the insalubrity of the country where those works are carried on. While these are the labours abroad, the co-operators have not been idle at home; for, under the active superintendence of Mr. John Walker, a Fellow of our Society, forty sheets of the Indian Atlas have now been published, and there are sufficient documents for twelve more, which are now in the hands of the engraver. These operations have certainly been costly, since the expenses already incurred amount to more than 360,000*l.*, besides all the instruments, as well as incidental and home expenses: but money was never better expended, whether we consider the honour reflected on the Directors, the intellectual character of the officers, or the absolute means obtained for improving the resources of the country and the condition of its people, the settling of disputed boundaries, assisting judicial decisions, and accurately defining public and private property.

Nor have the Honourable Company's marine surveyors been less diligent than their brethren on shore. The Coromandel coast, from Ennore, in latitude  $16^{\circ} 30'$ , to the Sautapilli Rocks, in  $18^{\circ} 5'$ , including a minute survey of Coringah Bay, has been completed by Lieutenant Fell, of the Indian Navy, and will be published very shortly. The remaining portion of the N.E. coast of Africa, west of Cape Guardafui, has been surveyed by Lieutenant Grieve, and will be given to the public during the present year. It is expected that the entire coast of Western India, from the Gulf of Cambay to Cape Comorin, will be completed in the ensuing season; and Lieutenant Fell is at present engaged in the examination of the N. coast of Sumatra.

The elaborate Wind and Current Charts, constructed by Mr. M'Farlane, are commended as of great utility; and we hear that they are likely to be published under the auspices of the Bombay Geographical Society.

I must again express my sense of the valuable knowledge circulated by the periodical press of India, and may particularly mention the Madras and Singapore journals. The publications of Oriental societies are also rich in local information, and the Journals of the Asiatic Society at Calcutta, and the Bombay Geographical Society, are of great interest; nor should the 'Proceedings of the Royal Society of Van Diemen's Land' be unnoticed. I should also mention that a book has been printed at Sydney under the title of 'Australian Geography;' it was written by Sir Thomas Mitchell, a distinguished member of this

Society, for the use of the schools in New South Wales, at the request of the Denominational Board of Education. This gentleman informs me, in a letter of the 19th of last January, that he has compiled, from the best sources and his own explorations, a general map of the colony, which has been engraved at Sydney under his directions, and a presentation copy is on its way to us by the hand of a friend.

Among our own proceedings you will recollect that Lal Sing'h, a member of the Nepalese Embassy to London, was introduced to your meeting by the Honourable H. E. I. Stanley, a Fellow of this Society; and that he addressed you on the geography of his country. According to Lal Sing'h, the boundary-line of the N. frontier of Nepal is incorrectly laid down in all our best maps, and should be moved further N.; and Lieutenant R. Strachey had no doubt but the proposed alteration would be found substantially correct.

We were also favoured with a visit from the learned and enterprising traveller, Professor Hermann Abich, who read a communication entitled 'Climatological Notices on the Country between the Black and Caspian Seas.' In this valuable description of a singularly remarkable tract, the Professor called our attention to the intimate connexion between geology and meteorology, noticed the outlines of the extraordinary variety of climate in the lands between the Caspian and the Black Seas, and sketched, with great ability, the geological and orological structure of these countries, which he had minutely examined by order of the Russian Government. Nearly the whole of this region is under able exploration; for, beside the labours of Professor Abich, a report has been made of M. Brosset's travels in Georgia, by order of the Governor of Caucasus. Colonel Khodzko ascended Mount Ararat last August, for the purpose of making some delicate observations in order to complete the triangulation of Trans-Caucasia; and from a part of the regretted Hommaire de Hell's Journal, lately read to the French Geographical Society by M. de la Roquette, that traveller had passed through the Caspian Gates, the Persian defile so celebrated by Arrian.

Further southward much has been effected by the spirit and understanding of our countrymen, insomuch that the tracts between Aleppo and Basrah are now opened to view. And here I cannot but congratulate you on the learned and lucid dissertation which Colonel Rawlinson, one of our Council, read before you last month, on the identification of the Biblical Cities of Assyria, and on the geography of the Lower Tigris; wherein many of his explanations were founded on the authority of remains previously unknown or unnoticed, or

derived from cuneiform inscriptions which scarcely any man but himself could have deciphered. Though this inquiry was essentially antiquarian and classical, it was also intimately connected with the geology and geography of those important regions; so much so, that such a view of the present state of that remarkable tract of country may lead to probable conclusions as to its future, as well as a clearer idea of its past condition. Some of the land along parts of the course of the Tigris had manifestly been elevated; but most of the changes of surface are due to the almost insensible inclination of the part irrigated and intersected by its rivers, from below the bifurcation of the Tigris to its confluence with the Euphrates. The whole of the alluvial soil from a great distance from their mouths, must have been gradually brought down and deposited by those mighty streams; and the extent is not of difficult ascertainment. The increment of land at the Delta formed by this action can be chronologically traced, and is found to have advanced since the commencement of the Christian era, at the extraordinary degree of a mile in 30 years, a rate of increase probably about twice that of the growth of the Sunderbunds, or any other known delta. This agrees, in fact, with the statements which Dr. Beke, one of your Fellows, published in the 'Philosophical Magazine' as far back as February 1834; and in his 'Origines Biblicæ' in the same year.

Lieutenant Richard Strachey, of the Bengal Engineers, read a very elaborate paper on the physical geography of the provinces of the Kumáon and Garhwál, in the Himalaya Mountains, and of the adjoining parts of Thibet; which narrative was beautifully illustrated by Mr. Arrowsmith. He began by giving a sketch of the general surface of Central Asia, pointing out that neither the Himalaya nor the Kouenlun appear to have any definite special existence apart from the general elevated mass of Thibet between them; which would thus seem to form the summit of a great protuberance above the general level of the earth's surface. He then detailed the physical features, culminating lines, palæontology, geology, meteorological phenomena, botany, and zoology of that stupendous region; and concluded by a sketch of the different races of men who inhabit it, drawn up by his brother, Mr. John Strachey.

The mapping of China remains, as far as I know, in the same state as when I last addressed you; for we have not heard anything farther from Dr. Gützlaff, nor has the Admiralty yet come to a decision on that head. I mentioned that it was the intention of the Hon. Edward Everett to present this Society with a copy of his curious Chinese map; finding, however, some difficulty in getting a true copy made, this

gentleman has sent us the original. But excepting some 'Memoranda on Hong Kong,' by Mr. William Scott, we have had no direct communication on the geography of the Celestial Empire. The Admiralty, however, have published some corrected coast charts of Canton, Formosa, and Korea.

Scintillations of light occasionally flit from the islands to the eastward of Asia and the Polynesian Seas; in which last a mighty progression has taken place in less than half a century. When I was at Hawáī in 1807 we found the island and its population just as Captain Cook had left it; but now, instead of meeting uncivilized idolaters with no dress but the *tapa*, Christianized men are met at every turn habited in European attire—houses with glazed windows have superseded the wig-wam huts—the canoes have given way to schooners and ships—and instead of utter ignorance, the natives are instructed by three weekly newspapers!

I have mentioned Mr. Petermann's map of Borneo; and much public attention has been devoted towards that grandest of the Eastern Islands. From the 'Moniteur des Indes' we learn that Dr. Schwaner has accomplished an interesting journey through the interior of Borneo, from Banjermasing to Pontianak. His intention was to ascend the river Kayan by boat, and seek along its northern prolongation a course towards Kattingan, in the neighbourhood of which he expected to discover the sources of the Melawi. He found that the river runs through a very fertile and populous region, the inhabitants of which are described as having attained an advanced stage of civilization, and as being desirous of establishing commercial relations with the Europeans on the coast. The true designation of this people is *Uadju*. The river Kayan is said to be of sufficient magnitude to allow of easy intercourse with this inland tribe. Dr. Schwaner continued his route towards the river Kapuas, with the view of determining the distance between the two streams, and ascertaining the character of the mountains separating them. It is to be hoped that our Society may soon be put in possession of fuller details respecting the Doctor's expedition than are afforded by the 'Moniteur.' Some interesting information regarding the aboriginal inhabitants of the island has been received from Mr. M'Dougall, of the Borneo Church Mission at Saráwak, who estimates the population as approaching to the hitherto unlooked for amount of six millions!

I have been anxiously expecting tidings respecting the long-absent Dr. Leichhardt, but the gloom which hangs over his fate has not, in

the slightest degree, dispersed. My friend Capt. P. P. King, R.N., in a letter from Paramatta of so recent a date as the 2nd of March, says, "Not a word yet of Leichhardt, whose time is up. A Spanish frigate, 'La Ferrolana,' has just arrived here from Swan River, where they had not heard of him. I am sure he will have pressed on to cross the Desert, and there he must have starved for water. The colonists have been making a stir about going in search; but I fear that he has fallen a sacrifice to his zeal and perseverance in trying to cross the wretched country which exists in the western part of these regions. Had anything happened to him in the early part of his journey, the mules would have returned to the settled districts." In this painful uncertainty, your constant friend, Admiral Sir Francis Beaufort, took charge of a letter requesting the Admiralty to direct a ship to look in at the deserted Port Essington now and then, under the chance of learning something of the traveller's fate.

Among the papers which were read this session, was one on the South Sea Islands, by Captain Erskine, of H.M.S. 'Havannah,' who officially visited the Samoan, the Friendly, the Feejee, and other groups of islands. In his brief but instructive remarks Capt. Erskine dwells upon the treacherous character of the Feejeans, and asserts that they are addicted to cannibalism to a degree neither known nor credited: and that although the murder of shipwrecked persons there is supposed to be a religious duty, there can be little doubt that the desire to eat the bodies is the principal cause of its continuance, human flesh being esteemed beyond all other kinds of food. "About the end of July," he observes, in his official Report, "three weeks before the arrival of the 'Havannah,' 14 women and 1 man belonging to a neighbouring town (with whom no war existed) had been stolen from the reefs, whither they had gone to pick shell-fish, and brought to Bau, to entertain the people of a tribe who had arrived there with their periodical tribute, two or three having been previously entrapped from other quarters and eaten. The missionaries, Messrs. Lyth and Calvert, were absent from Vewa at the time, but their wives immediately crossed over to Bau, and having in the most daring manner forced themselves into the house of Tanoa, the father of Thakambau (a piece of sacrilege for women to attempt), begged the lives of these unfortunate wretches. Ten had already been slaughtered (two of them in the hearing of these heroic ladies), but the lives of the remainder were granted to their intreaties. On my visit to Bau I was shown the remains of the bodies suspended to trees, and the ovens in which they had been cooked, by

some of the persons in whose behalf this feast had been prepared, with evident surprise on their part that such a sight should excite any feelings of horror or disgust."

This distressing recital led to an argument in which humanity and feeling bore hard upon judgment; for though the practice of anthropophagia is revolting to our ideas, there can be no reasonable doubt of its existence throughout a large portion of the Pacific Ocean. Capt. Fitz-Roy assures us that it also prevails among the miserable Fuegians; and information from Mr. M'Dougall confirms the rumours, long circulated, of cannibalism in Borneo. It seems that a Dyak who had travelled from the interior to Saráwak for medical assistance, told him of a race on the borders of his own tribe, who were perfect gluttons in human flesh, preferring it to any other food. He minutely described the cutting up and cooking of the victims, men, women, and children; adding, that with the exception of this horrible propensity, they are a very good and honest people.

The existence of so abhorrent a practice in New Zealand, Tierra del Fuego, Sumatra, the Andamans, Borneo, the Feejee, and other islands, in places exuberantly fertile as well as those which are sterile, proves that hunger is not the only motive for an abomination which, in numerous cases, is evidently independent of necessity.

#### AFRICA.

Though all beyond the coast of Central and Southern Africa is still almost a blank in our maps, yet the determined enterprise and activity of Europeans, and especially of our own countrymen, are continually breaking through the barriers hitherto opposed by the barbarism of the natives and almost impassable deserts, at a short distance from the sea in nearly every part of that still benighted quarter of the globe.

Unlike some of the trackless wastes of the interior—*leonum arida nutritrix*—Egypt has exhibited a lively resuscitation after many ages of torpor; and now promises, more than ever, to be the passenger-path between Great Britain and her Eastern Dependencies. The recent masterly operations of M. Bourdaloue for levelling the Isthmus of Suez, have produced a result differing widely from that of the harassed French savans in 1799: for he has shown, that instead of a fall of 30 feet, he detected little or no difference of elevation between the level of the Red Sea at Suez and the Mediterranean at Pelusium. That experienced and intelligent engineer, Mr. Robert Stephenson, has lately examined the site, by walking over the greater part of it; and he has been kind enough to show me his route on a map of large scale. This

gentleman gives reasonable grounds for concluding that the Bitter Lake was formerly the head of the Red Sea, with the cities of Serapeum and Taubastum—the extensive ruins of which now stand in an arid desert—bordering the beach. The ridge between the Red Sea and the Bitter Lake, not above 7 or 8 feet high, he considers to have resulted from a geological upheaval, the fossils and shells on both sides of it being abundant and identical. From an investigation of the Canal of Sesostris, the Lake Tamsah, and numerous scattered vestigia, Mr. Stephenson has no doubt that the district was very fertile when Serapeum was built; and as he has actually undertaken the charge of constructing a railroad from Alexandria to Cairo, and from thence to Suez, we shall soon be in possession of every topographical feature of an intensely interesting country.

This reminds me that the recent archæological researches of Professor Lepsius, in the Valley of the Nile, have given rise to much geological discussion. This observant gentleman infers, from certain sculptured marks on the solid rocks at Semne in Nubia, as well as in the foundation stones of buildings, that the Nile must once have flowed at a level considerably above the highest point which it has ever reached during the greatest inundations of modern times; in fine, that the entire bed of the river in Lower Nubia must have been excavated to a depth of 27 feet since the time of Mæris, or about 2200 years before our era. As some of the assumptions upon which this opinion is based appear to have been admitted too hastily, and the problem of such an abrasion being one of interest, the whole is about to undergo a strict scrutiny, at the suggestion of Mr. Leonard Horner, F.R.S. The moderate velocity of the stream, and the hardness of its siliceous-sandstone bed, certainly render such an abrading power a startling hypothesis; still there is ground for thinking that extraordinary changes are in operation in those regions. I mentioned last year that M. Rochet d'Héricourt believes the soil of the Arabian Gulf and of Abyssinia to be in a constant process of elevation, which, considering the vast number of hot springs he met with, and the abundance of active or extinct volcanoes, he attributes to volcanic action: and he assigns the ruin of Adulis on the Red Sea, not that near Báb-el-Mandeb, to the rising of the ground.

The geodetical and topographical details of Algeria are advancing; and the Minister of War in Paris, wishing to hasten them, has given permission to Captain Galinier to connect the whole operations of the several provinces, particularly the trigonometrical work of Captain Morel between Oran and Algiers. Mons. Bargès had made a tour to



Tilimsán, and from thence to Sebdú, on the borders of Morocco, and to the Algerian Sahrá; but the part of his journal which has been made public points out little that is new. Indeed our chief expectation of discoveries in those quarters is derived from the expedition to Central Africa which left Tripoli last year under the direction of Dr. Barth and Mr. Richardson; of the progress of which, through the kindness of the Chevalier Bunsen, Dr. Beke, and Mr. Petermann, we have had the satisfaction of hearing. It seems that they crossed the Great Desert, and arrived on the frontiers of the kingdom of Aír or Asben, where they encountered considerable hostility from the natives. Matters, however, had been amicably arranged by the powerful Prince En-Nür; so that at the date of Dr. Overweg's last letter to the Chevalier Bunsen (*27th of October, 1850*) the expedition intended to start for the south in a few days, and we hourly expect news of their having reached the borders of Lake Tchad. The travellers had collected much valuable information relative to the resources, surface, geology, and natural history of the countries they passed through; and from the excellence of their instruments and their skill in using them, determinations of latitudes and longitudes to a considerable degree of accuracy may be expected.

Although but little of a decided geographical import may have been reaped in Western Africa which has reached us in the past year, our acquaintance with it is ever on the increase. Lieutenant Duburquois wrote an account to Captain Bouët-Villaumez, Commandant of the French naval division there, of his exploration of the river Tendo or Tanóe, accompanied by a map constructed by himself. M. Duburquois repeated and verified the former observations on the great lake Ahy, to which I last year alluded; and proceeded up the river for 40 leagues, when he was obliged to return, as the water was daily diminishing from dry weather. Our moral information respecting the benighted slave nations has also been increased by a book on Dahomey and the Dahomyans, the author of which is Commander Frederiek Forbes of the Royal Navy, a Fellow of this Society, who accompanied the zealous Mr. Duncan to Abomey, and who has studied the languages of the coast with considerable effect.

The perseverance of our travellers is opening to us new fields of knowledge in South Africa, where the Rev. Mr. Livingston has announced the existence of another large lake within 200 miles to the north-westward of Lake Nǃgami. These two sheets of water are connected by a rapid stream called the Teoge; and the new lake is said to contain some large islands, upon one of which the well-known chief

Sebetoane resides. Mr. Frank Galton, F.R.G.S., as you may remember, left us last year with the intention of proceeding to Lake Ngami, but certain political aspects—discontented Boers being then in possession of the country north of the Vaal River—induced him to sail for Walvisch Bay in a small schooner, by which he would so far avoid many difficulties at the outset of his undertaking. Besides his friend Mr. Andeson, he was accompanied by seven able servants; and on landing he intended to proceed to the missionary stations, and from thence to penetrate to a Lake Demboa, reported to surpass the Ngami in extent. Considerable apprehension was entertained that this intention would be marred by the state of the country at that moment; but my friend Mr. Maclear, the Astronomer Royal at the Cape, in a letter of last February, says—“You will receive by this post an account of that notorious Namaqua plunderer, Jonker Afrikanda, and his performances in the direction of Galton's track. But Mr. Haddy, the Wesleyan Missionary, who was lately with Jonker, assures me that Galton need have no apprehension on that score. But he thinks it probable that the tribes between Jonker and the Lake will be suspicious of all visitors. On the other hand, Mr. Hahn, the Rhenish Missionary, upon whom the traveller intended to call, is an active, enterprising man, and will undoubtedly offer his company to the Lake. I know Hahn personally, and I believe his knowledge of the native languages there, together with his imposing personal appearance—almost a Bruce—and experience of various tribes, will provide a complete frank on the path. The present unforeseen Kafir war will probably not be even heard of in the Dammara country; deserts, rebel Boers, and quarrelling tribes intervene. Such people know little beyond their own *worlds*, and care but little for that which does not immediately concern them.”

Since this letter of Mr. Maclear's, Mr. Arrowsmith has communicated one from Mr. Alfred Dolman, the companion of Mr. Gassiot jun., which, under date of April 8th, announces the failure of their expedition into the Namaquas' districts, “and that too,” he says, “by our own fault, in too readily listening to the interested advice of certain parties.” It seems that, in pursuance of the reliance placed on the counsel thus given, the party landed at Angra Pequena, and made their way to Bethany.—“We did not wish to go to that desolate place,” writes Mr. Dolman, “but the native chiefs deceived us, and just guided us wherever they chose. Despite the praises of the missionaries, I must say that the Namaquas are the greatest liars and ruffians I ever met with.” Disgusted with their intercourse, and distressed by a scarcity of food and fodder, our travellers

began their return march through a burnt-up desert: they encountered much hardship from want of water, and reached Kamaggas, on the borders of Clanwilliam, with the loss of 19 oxen, 3 horses, and 10 dogs on the road. Nothing daunted, these gentlemen were about to start into the interior, to reach the Limpopo.

An account of the Dammara country has been drawn up by Mr. F. W. Kolbe, a Rhenish missionary, by which it appears that there is a practical route to the Lake from Walvisch Bay, and that Elberfeld, the farthest of the stations, is only 300 miles from Lake Demboa. It also appears that the missionaries of the Dammara communicate with Cape Town by way of Angra Pequena, which, though rather more distant from their stations than Walvisch Bay, is found to be the easier route, both on account of the country's being less sandy, and the communication with Table Bay by sea more easy. The rainy season in these districts commences in October, and lasts till March or April: the climate during the remaining months is very agreeable, being clear and bracing, though piercingly cold in the night. The country abounds in wild beasts;—lions, leopards, rhinoceroses, hyænas, buffalos, giraffes, zebras, gnus, and many kinds of antelopes, are found in great numbers.

The Dammaras are a numerous people, and of the Kafir race. Messrs. Galton and Oswell have instructions from Sir Harry Smith to communicate with the native chiefs near the Lake, and to endeavour to induce them to establish friendly relations with the Colonial Government, for the purpose of trade and discovery.

The bishop of the colony had returned from an anxious and laborious visitation tour through the whole extent of his diocese (800 miles east and west), as well as Kafaria Proper. His Lordship left Cape Town on the 1st of April, 1850, and was nearly nine months absent, during which his journeyings exceeded 4000 miles, in districts only passable in a cart, on horseback, or on foot. His journal is full of interest, and will probably be published in the course of the next month.

The east coast of Africa may be deemed to be in steady advance, and destined for a more regular commercial communication with the rest of the world than has been practicable for many ages; and much of the geographical confusion in that region is likely ere long to be removed through the agency of the missionaries. Thus, among the African journeys, none can be of higher interest to the inquirer than those of Messrs. Rebmann and Krapf, from Mombas into Jagga, Taturu, Wakamba, and other districts which must be recognised as part of the

Uniamés, or Country of the Moon. These intelligent and persevering missionaries were rewarded with the discovery of Killimandja-aro, and, since I last addressed you, with Kenia, another stupendous eminence covered with eternal snows. Now, though Ptolemy's data—grounded on Herodotus, Marinus Tyrius, and the reports of merchants and travellers—cannot be greatly relied upon, these elevated ranges appear to be in the vicinity of the spot where the source of the Bahr al Abyad, or White Nile, will be found. The table-land of eastern Africa, instead of consisting, as was generally supposed, of a succession of plateaux, or terraces rising above one another from the shores of the Red Sea, is found to be an elevated region of irregular surface, abrupt towards the Indian Ocean, but shelving down gradually towards the Valley of the Nile.

From inquiries which I diligently made in North Africa many years ago—some of which, bearing on the great western arm, or Nile of Herodotus, were published in the Quarterly Review for January, 1818—I am, of course, very strongly interested in the question. And these were the inquiries which, together with the results of my own journey to Ghirrzah, in 1816, induced our Government to send out an expedition to explore Africa from its northern frontier. From these circumstances, and a study of nearly all which has been written on the subject, I have certainly formed a decided opinion respecting the geography of these regions. I shall not here allude to the controversial disputes which have so greatly mystified the rise and course of that wonderful river the Nile; but must unhesitatingly express my own conviction that NO EUROPEAN TRAVELLER, FROM BRUCE DOWNWARDS, HAS YET SEEN ITS TRUE SOURCE. It still remains an important geographical problem, one which will never be satisfactorily solved till successive explorations have shown which is the main stream that gave birth to that mighty river. Till then we must still say—“*Ignotum, plus notus, Nile, per ortum.*”

#### AMERICA.

Notwithstanding that our acquaintance with America is barely of 360 years' standing, the boundless speculations of commerce, the successful labours of intelligent travellers, and the truly British energy of the Anglo-American population, have made every portion of the New World better known in that comparatively short period, than large tracts in the Eastern Hemisphere. But we are now proceeding from a general to a particular knowledge, and the surveys of the British pos-

sessions are gradually advancing. During the past year several sheets of the labours of Capt. Bayfield and his assistants, already mentioned to you, have been published by the Admiralty; including Buctouche River, Mabou Harbour, Crapaud Roads, Campobello Island, and the 9th sheet of the Gulf of St. Lawrence.

Nor has the diligence of the Americans, to which I alluded in my last Address, slackened. The coast survey has been steadily carried on, under organized parties divided into eleven sections, or rather stations; who push forward the field-work and hydrography simultaneously; and the observations for differences of longitude by the electrical telegraph, are advancing under the assiduous care of Mr. Sears Walker. Numerous sheets have been published within the year, and the first part of the Chronometric Expedition to determine the difference of longitude between the United States and Great Britain, has been brought to a close: the second series of those observations is in hand. The very able and detailed Report of this grand survey, by Professor A. D. Bache, its superintendent, was forwarded to your library by the kindness of the Hon. E. Everett, and is in every respect a model for works of that kind. Mr. Everett also had the kindness to send me the elaborate Chart of the Trade Winds of the Atlantic Ocean, together with the investigation of the winds and currents of the sea, by Lieut. Maury, of the United States Navy, and Superintendent of the National Observatory at Washington. Nor has his courtesy stopped here—for I received the recent survey of the California and Oregon coasts, just completed by Lieut. M'Arthur; "who, poor fellow (he adds), has not lived to enjoy the credit of his work, but died the other day at Panamá, while on his return home. This arduous work was undertaken and accomplished by M'Arthur under exceedingly trying circumstances. He arrived in California with a small vessel during the worst phase of the gold fever. His crew revolted and deserted; and on one occasion pitched an officer into the sea, who by the merest miracle drifted to the shore, and was restored to life. The mutineers were pursued, captured, and hung; but while pushing his labours, the active commander had been obliged to manacle his men to their boats."

Capt. Ringgold, of the American Navy, is now preparing a series of maps of high interest: they comprise the bay and harbour of San Francisco, with the Farellones, the bay of San Pablo, and the Strait of Carquials. There has also been an expedition to explore the Rio Grande del Norte; but it was found that, though that river has plenty of water, it is so much interrupted by rapids that unless some of the

rocks are cleared away it must remain unnavigable even for steamers: the adjacent country is represented as being of astonishing fertility. Utah, the new territory inhabited by the Mormons, has also been partially examined. Its physical situation is described as very curious—surrounded on all sides by frightful rocks covered with snow or saline efflorescences; the vast basin in which they have placed their city is fertile, healthy, and estimated to be capable of readily supporting a million of people: it is about 560 miles in diameter, and elevated 4000 or 5000 feet above the sea. Capt. Stansbury, of the Topographical Engineer Corps, had made a survey of that singular sheet of water the Great Salt Lake, and pronounces that the accounts of it had been exaggerated. "That it has no outlet," he says, "is now demonstrated beyond doubt: and I am convinced, from what I have seen, that neither the river Utah (Jordan of the Mormons) nor the lake can be of the slightest utility to commercial navigation."

The late movements have seriously invaded the property and "vested" rights of the Red Man, who must ere long succumb to his fate. Mr. Catlin, the well-known traveller and historian of the North American Indians, and whose recent plan for the institution of a *Museum of Mankind* has met with the approbation of many influential members of the Geographical and Ethnological Societies, has prepared and laid before the latter an exciting paper on the physical peculiarities and peculiar customs of the *Mandans*, a recently extinguished tribe of the Red race. In this valuable communication he has laid open the strange religious ceremonies of that tribe, with all its connecting links, many of which it was necessary to omit in the published accounts. He has also advanced his own reasons, founded on certain striking resemblances in customs and language, for believing that the Mandans were an admixture of an original American stock with some colony of Welsh; and this he is disposed to attribute to the expedition which sailed from North Wales, under the command of Prince Madoc's brother, in the fourteenth century.

Much attention has been paid in America towards impinging upon time and space, as respects the communication between the Old and the New Worlds; and especially as to shortening the time of passage between New York and London. The most received project is founded on the fact that railroads are three times as expeditious as steamers; consequently, instead of embarking at New York, it is proposed that passengers should proceed by land as far eastward as a railroad can be carried—that is, to the utmost verge of Nova Scotia—and there embark. They then should make the best of their way to Galway Bay, and take

to the railway for Dublin. Now, after what has been achieved in international communication of late, we may reasonably hope for further improvements. A voyage to the East Indies and back in former times occupied a couple of years, or more; ordinary merchantmen can now manage the same in nine months. In 1750, a time when the trade winds were pretty well understood, three fine Indiamen—the 'Ilchester,' 'Anson,' and 'Shaftesbury'—sailed from the Downs on the 5th of April, and arrived at Bombay in September: in 1850 the same voyage is averaged to occupy 75 days, and news is carried by the overland mail in less than a month. This is owing to a proper application of science and experience; and I cannot but augur that Lieut. Maury's inquiries—as shown in the charts I mentioned—will still further abridge our longest oceanic voyages.

Perhaps I ought not to allude to Lieut. Maury's most useful labours from this chair, without at the same time expressing an opinion upon so remarkable an application of the laws of atmospheric movements to the purposes of accelerated navigation. Without detaining you with an enumeration of the indistinct notions hitherto entertained respecting the winds, I will at once say, it is but lately that the subject has been so scrutinized as to render it not improbable that the constant succession of cause and effect may at length be ascertained; and undoubtedly, the nearer we approach that important subject, the larger and more comprehensive will be our views. The inquiries of Capper, Redfield, Reid, Dove, Thom, and Piddington, recorded more accurately than before the laws of atmospheric phenomena, but left the theory of them almost untouched. The next stride towards the development is advanced by the Wind and Current Charts constructed by Lieut. Maury, from all the accessible log-books of American ships—the direction and strength of the wind as observed daily, compared with the track of the ship, and distinguishing the variations at different seasons of the year, and other essential data not previously collected. In this laborious work it were much to be desired, that the observations noticed had been a little more accurate; that some instrumental method had been employed in determining the exact character of the apparent wind, and that this had been corrected for the motion of the vessel. The introduction of a marine anemometer,\* and a more accurate scheme of registry, would refer such observations to exact ideas of number and

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\* My son, the present Astronomer Royal for Scotland, in conjunction with Captain Cockburn, R.N., has had such a machine made; and his attempt to improve the present methods of determining the strength and direction of the winds at sea will be found in Vol. XVI. of the Transactions of the Edinburgh Royal Society.

measure, the only inductive road to truthful utility. But, with all my admiration of Lieut. Maury's line of investigation, I cannot consider him as happy in supposing magnetism to be one of the most powerful agents of causation; in this he will perhaps find that he is leaning on a broken reed.

Another intelligent officer of the American Navy, Lieut. Charles Henry Davis, with whom I have had the pleasure of being in correspondence, has directed his attention to the duties intrusted to him with a philosophic mind. So long ago as September, 1848, he wrote—"I have recently arrived at some interesting conclusions concerning the connection between the tides and other currents and the alluvial deposits in the depths and on the borders of the ocean; and my views bear out the theory that attributes the principal changes in the condition of the earth's surface to causes now in operation. I am able, I believe, to show a permanent and natural relation between the local and general tides on the one hand, and the eastern border of the United States on the other; between the shores of the Gulf of Mexico and the currents by which they are washed. The sandy deposits on the Atlantic border are remarkable in outline as well as in quantity. A narrow strip on the coasts of Florida and Georgia spreads out into those prominent capes and enormous banks and shoals which give such a peculiar character to our navigation. On the shores of Europe the vast deposits of similar material at the bottom of the Bay of Biscay, and in the North Sea, are to be traced to the same laws of tidal action. The theory will also account for similar deposits elsewhere, and for the banks and shoals composed of the coralline detritus in the Indian Seas." Since this was written, Lieutenant Davis has given the American Academy his views on what may be termed Tidal Geology, and the consequent formation of shoals, banks, bars, beaches, hooks, and sea-walls; and he has succeeded in tracing the effects of great causes through all their mysterious phases, with the cautious observation and inductive experiment which science demands.

From the more central parts of America we have received notices of a local character—as, for instance, the ascent of Popocatepetl, near Mexico, by Mr. Edward Thornton, which was read to you in March. This was once esteemed a formidable feat; but, though demanding energy and physical endurance, it is now shown to be an undertaking of no very extraordinary difficulty, since there is established in the crater itself an organized company of adventurers, who daily work therein, extracting sulphur for sale in Mexico.

A letter has been received from Sir Robert Schomburgk, at St.



Domingo, regretting that political occurrences had confined him to the neighbourhood of that city. He had, however, succeeded in making some chronometric measurements, and becoming acquainted with many of the physical features of the country, which, when complete, he hopes will be sent by Lord Palmerston to that Society which patronized his first geographical aspirations, and whose child he considers himself to be.

A communication was made to us on the Island of Ruatan, in the Bay of Honduras, by Commander R. C. Mitchell, of H.M.S. 'Sappho,' the principal feature of which is the account of the present inhabitants of that place. But the neighbourhood reminds me of an excellent little publication by Mr. O'Gorman, one of your Council, on a subject of high import. It is intitled 'The Mahogany Tree,' and treats of the botanical characters, qualities and uses, and other particulars of that most valuable timber; with practical suggestions for selecting and cutting it in Central America, and other regions of which it is a native. The book is illustrated with engravings, and accompanied by an explanatory map on a large scale, showing the mahogany districts, and other fine forest-tree countries. This was drawn up by another of our members, Mr. Trelawny Saunders, and merits notice for its accuracy.

An American traveller has sent an account to the Geographical Society at Paris, of his meeting with M. Bonpland, Humboldt's celebrated companion, near San Borja, where he lives happily with his family, constantly making additions to his Herbarium, which he considers as belonging to France, and which contains at least 3000 plants; the collecting of it seems to have obliterated the bitterness of his forced detention by Dr. Francia.

A paper of great interest was read, on 'The Geography of Southern Peru,' by Mr. William Bollaert, a Fellow of this Society, to whom our Journal had been previously indebted. He described a part of the country less known to Europeans than the rest of the province. Leaving Arequipa, at the foot of its snow-clad volcano, he passed desert plains with their vast tracts of moving hemispherical sand-hills (*medanos*), which have been known to overwhelm the traveller under their shifting masses. The district of Tarapaca—with its rocky mountains, its desert steppes, and its mines of silver—was next examined; and Mr. Bollaert believed that the huge range of Lirima, in the Cordillera Real, will, upon further investigation, prove to be the culminating point of the New World.

The anxiety to which I last year alluded, respecting an equatorial channel of communication between the Atlantic and Pacific Oceans,

appears to be on the increase in America ; and has been the occasion of such animated discussion among ourselves, that the interest taken by the Society in so great a question cannot be misunderstood. There can be little doubt that the time has arrived when this gigantic task will be commenced ; and the place to be chosen for the purpose of ensuring success, must lie somewhere between the 4th and 13th degrees of North latitude. But, as before observed, there are several sites for lines in that interval, each of which are strongly but not dispassionately recommended by the respective parties ; and it is somewhat of a tax on the judgment whether to side with this or that projector, this or that engineer, or even with the committee on naval affairs on the other side of the Atlantic, who made an official report to Congress on the subject. Such was the state of our information, when the excellent summary drawn up and read by Captain Robert Fitz-Roy, of the Royal Navy, at the suggestion of Dr. Norton Shaw your Secretary, came before you, forming a considerate, searching, and matter-of-fact examination of each of the plans proposed. This chain of argument on the Great Isthmus, illustrated by a very carefully executed map by Mr. Arrowsmith, is now published in your Journal ; but the topic demands a few more words, since public attention has been so strongly turned to it, not only on account of political and commercial considerations, but also because of the higher interests it possesses. Struck with the advantages likely to accrue to navigation, trade, and civilization by so grand an effort, M. Jomard says it pertains “ à la science géographique la gloire d'avoir préparé cette révolution ! ”

Captain Fitz-Roy assumes that “ the *principal* object in view is a navigable channel between the two oceans, through which the largest ships may pass without breaking bulk or being lightened ; the *least* object contemplated is a common waggon-road.” Remarks follow on the existing methods of conveyance across Central America ; on health in that climate ; on storms ; on volcanic action ; on the resident Indians ; and on political obstacles. A few diminished tribes of independent Aborigines still inhabit the mountainous ranges, and oppose the access of travellers. The political instability of the local governments is insisted on as a material obstacle in the way of executing great works in Central America ; and great stress is laid on the urgent necessity of having adequate harbourage at each extremity of any canal or railroad that may be constructed. “ Another momentous consideration must not be forgotten, which is, that the larger and better the canal, or other means of intercourse (*cæteris paribus*), may be, the

greater will be the world-at-large profit ; while, on the other hand, the smaller the scale of the work effected, the more exclusively local must it become in value."

The four principal and several secondary lines were proposed and discussed, and I think their peculiar features were impartially stated ; but Captain Fitz-Roy makes a general summary, showing that only one line, namely, " The Cupica and Atrato route, appears now to offer a reasonable prospect of encouragement to undertake the construction of a ship-canal ; and that only one other route, from Porto Bello or Manzanilla to Panamá, seems likely to become the site of a great permanent road for traffic, if not for a railway."

Such is the state of the case as it now appears before us ; there can, however, be no doubt that, notwithstanding the labours of many intelligent surveyors and travellers, we are still in want of more precise local knowledge, and the suggestions of experience. It is therefore an undertaking which can only be executed efficiently under the patronage of government, not by the limited means of an individual association : no public minister, nor any speculative capitalist, will now act on the reports of moderately-qualified and irresponsible examiners.

This magnificent scheme has, however, met with an opposition from Mr. Asa Whitney, the projector of a gigantic railway for connecting the Atlantic and Pacific Oceans, thereby approximating what he terms the great centres of the populations of Europe and Asia. While the easternmost point of departure in America should commence at Halifax or New York, Mr. Whitney proposes that a belt of territory 60 miles wide—30 miles on each side of the road—with its eastern base on Lake Michigan, and its western on the Pacific, a length of 2000 miles, comprehending about 78,000,000 of acres, shall be appropriated to this object. The capital wherewith to construct this road, Mr. Whitney proposes to create by the increased value imparted to the lands thus consigned, and reclaimed from the wilderness, by the construction of so grand a railroad, with its commercial agencies and electric telegraph. Besides the startling nature of the project as regards the enormous tract of country intended to be crossed, the originality of carrying out so vast an undertaking, not by the usual method of loans, but by the positive creation of capital, must strike every one ; and so strongly is the projector imbued with the prospect of entire success (and he appears to command all the bearings of the case), that he feels confident that were his road made, and the Isthmus of Panamá washed away, so as to leave an open passage for fleets, the former would have to bear the whole commerce of the globe. The arguments *pro et con* are now

under agitation ; but through all a characteristic instance is given of the Anglo-American propensity to be "doing."

#### CONCLUDING REMARKS.

Having thus shown the principal features of the geographical undertakings of the last year in detail, I trust you will allow me to embrace the occasion which now offers of delivering an opinion or two respecting our own duties. In so doing let it be borne in mind that things, and not persons, are the objects of my remarks ; and not a word must be misinterpreted into a disparagement of the devoted and fatiguing exertions of travellers, or an attempt to discourage their views and labours.

In the recent and vast strides which knowledge has been taking, a strong proof is afforded that by the active labours of the mind the supremacy of man is maintained, his wants ministered to, and the amenities of his life increased. Hence the numerous conventional methods adopted for the enjoyment, diffusion, and promotion of information, as clubs, reading-rooms, public libraries, and societies. The three first are fast becoming essentially necessary to the social existence of civilized life, and are therefore open to all members of community, even to those of the merest rudimental education. But Societies are particular associations for the furtherance of some selected branch of science or knowledge, in order to promote the cultivation of it by bringing together those who are interested in such pursuits. The components of such bodies are to be considered of a higher intellectual training than is necessary for a mere reading-room,—since it is the advance of a science, and not the lighter personal requirements, which ought to be their ruling passion ; hence the necessity of qualifications so strictly demanded by most incorporations, with every testimonial for the admission of a new member.

In a prospectus which I drew up, printed, and circulated just before the first establishment of the present Society, the ends and objects of such an association were stated ; and on a recent reference to that document I find that my opinions remain unshaken. The principles of the argument were congregation, co-operation, and the establishment of a safe deposit in which the contributions of the whole geographical world might be received, preserved, and rendered easily available to every inquirer : and while the utmost encouragement was held out for the convenience of members, the promotion of travels, and the tendering of aid to the merest tourists, the fuller nature and conclusions of your enrolment were thus pointed out :—

Geography	Absolute	Of the mass and form of the globe.
		Motions and intrinsic properties of the globe.
		Of effects from celestial causes.
	Physical	Natural divisions and geological features of the world.
		Mountains, plains, deserts, mines, and minerals.
		Particulars of the animal and vegetable kingdoms.
		Seas, lakes, rivers, and springs.
		Currents, tides, hydrographical data.
		Climate, winds, weather, and seasons.
	Special	Volcanoes, earthquakes, and other phenomena.
		Ancient and modern history of the earth.
		The distribution of races and languages.
Names, derivations, and revolutions of states and cities.		
Latitudes and longitudes, astronomical and geodesical.		
The variation, dip, and other magnetic phenomena.		
Political	Determination of heights and distances.	
	Relative magnitudes of all countries and nations.	
	Population, division of the people, general statistics.	
	Artificial divisions of lands, agriculture, produce.	
	Commerce, manufactures, fisheries.	
	Government, manners, customs, laws, policy.	
	Canals, roads, mills, bridges, markets.	
	Religion, education, forces, arts.	

Now we have principally exerted ourselves, and I am happy to say with beneficial effect, on the two latter divisions of this scheme, while a world of work still remains almost *in statu quo* in the first, and comparatively little has been done in the second. I might be here told that the art of pointing out the principles of correct geography, and the art of correcting elemental geography itself, may often be two things widely differing *in genere*; but I well know the value and advantages of theory and practice rowing together. It is under this persuasion that I venture to point out the necessity of introducing greater exactness, more philosophical method, and more numerical precision, into all observations, instead of what was little better than mere guess work. From the unwearied pains of intelligent travellers we have a large insight into the animate and inanimate relations of foreign countries, into the soil and geology, the face and produce of the surface, and what lies beneath it; the rivers, lakes, mountains, climate, and the natural history strictly so called: particulars which their talents, and the acquisition of modern languages, have enabled them to obtain. This, however, is not enough to form the staple of a Society's care. Something higher is imperatively necessary to enable us to advance; but in begging your sufferance for a few minutes longer I shall adhere to the practical branches of our duty, without venturing to soar into the Empyrean regions of the higher sciences.

The preceding details of what has been accomplished in various parts of the world during the past year may surely be regarded as very

encouraging; and although no very notable or striking discovery may have been made, it is abundantly shown that the men of the present day want neither the fervour of spirit, the power of mind, nor the vigour of body which have distinguished the leaders of past ages. It is to be remembered, too, that any really great discoveries are neither made, distinguished, nor recognised in a moment. We no longer hear now, as of erst, of new continents having been found, or new oceans explored: these are no more the days of that almost romantic epoch which forms the great landmark in the history of geographical progress, when every voyager was able to take possession of vast territories in his own or his country's name. We now know tolerably well the size of the world, the extent of sea and land, the forms and characteristics of each portion; and if in the middle of some inhospitable continent there still exist any tracts unknown to us, they are comparatively unimportant in the economy of the whole globe. And every post brings us news of still further advances made even in such tracts; so that if we cannot yet say decidedly that there are no blanks in the map of the earth, no long period will elapse before that can be affirmed. One by one the last remnants of the unknown will yield to the efforts now made: but had we even actually arrived, at so desirable a consummation, would our labours then be terminated? Would geographical societies cease to be requisite?

Certainly not. Our work might then be said to be only beginning. Till we actually know the whole extent and surface of the globe on which we move, its peculiarities as a whole, and the mutual relations of its separate parts, it can never be thoroughly investigated or understood; and much may long remain, as it is now, only a source of wonder and confusion. Those who have not overlooked causes and their necessary consequences, will entertain no distrust of the future. To accommodate ourselves to a different state of requirements, and keep our Society in the van of its votaries, it is only necessary to look out ahead. Among other matters, more congenial appreciation must be shown for sciences which commonly have been looked on as diverse from geography, but which, though apparently standing on a different course, are really all tending to the same end. We must, in fact, look upon everything in a larger point of view than before—not in parts, but as a whole—and then we shall find new worlds of mind and matter awaiting new Alexanders to conquer them. Whether studying the superficies of the earth, or investigating its peculiar properties as regulated by organic forces and cosmical dynamics, ours is, in every way,

a progressive science of observation ; and one which, by lifting us out of that cheerless philosophy which regards not a material creation, advances the high intelligence of our nature.

It is therefore evident that, in the present stage, all possible precision and accuracy in his observations is more than ever indispensably necessary, if the traveller wishes them to be of any real value ; nothing should be left to the mere testimony of the senses, and actual admeasurement, where practicable, should never be omitted. As astronomical determinations are indispensable for fixing the positive and relative positions of places in our maps, no traveller should neglect to acquire the habit of using such means of ascertaining the latitude and longitude of any place not previously visited, as in the present state of science can readily be acquired. The improved form of the Nautical Almanac, of instruments, of observation, and of reduction, render these determinations so easy, that those are now inexcusable who fail to perform better what was so often tolerably done under the greatest disadvantages. When we speak of modern maps as very great improvements on those of the last century, we are apt to forget how few of them rest on any certain data, how rare are the cases where actual surveys have been made, and of how very late a date are the triangulations upon which alone a truly correct map must depend for accuracy. It but too frequently happens, that the most careful combination of imperfect materials leads to the continuation of error instead of the establishment of truth ; of this a better proof cannot be adduced than the maps of that indefatigable and able geographer, the late Major Rennell, once so highly esteemed, now so completely superseded. These considerations should induce future travellers to fix their attention exclusively on such observations as lead to certain and ready results, not such as can only be verified in distant times and places. In all widely extended countries the astronomical data should alone be used, and so used that the probable error of each result may be stated. Differential methods—mostly so captivating by their easiness, but which are liable to increase in unknown deviation from truth the further they go—are to be carefully avoided, except when they can be adopted with some wholesome check on their vagaries.

I should here remark that, while advocating the best obtainable results, I am not insisting on perfection : the idea of absolute accuracy in anything is totally discarded by all truly scientific men ; and no *ipse dixit* from any one—however able and however honourable—produces conviction. Let no one, therefore, delude himself that his instru-

ment can be perfect ; be it what it may, it must have errors of construction, and perhaps errors of principle too. The nature and amount of such irregularities should be carefully detected and minutely recorded ; for even though they may be too small to produce any sensible effect on the numerical reductions, they should nevertheless be stated, as necessary to furnish a clue regarding both the observer and the instrument.

The importance of these considerations will be evident, on recollecting that the general principle of geodetic surveying consists in the measurement of the various angles of a net-work of triangles spread over the surface of the country to be examined, and the determination of the magnitude of their sides in reference to one or more accurately measured bases. The position of these triangles is then to be resolved in relation to the meridian, and parallels of latitude, of the terrestrial spheroid. At a casual glance it might appear that such a process was one of no great complexity, and within the reach of persons of moderate acquirements ; this, however, would be a very mistaken opinion, for every error of measurement or observation, every fault of calculation, and every omission of circumstances, is multiplied and increased as the survey extends ; hence the absolute necessity of intelligence, activity, and science well applied, in the conduct of national surveys.

This is hardly the place to enter into the requisite instrumental and practical details, or I would proceed to point out the best sort of instruments for geographical travellers in various parts of the earth, according to the degree of magnitude or accuracy they might wish to attain ; but I cannot help observing that this is a point wherein there is still room for improvement. For hasty travellers the self-same methods as are used at sea have been too immediately recommended, without considering the change not only of instruments, but also of objects of observation, required by the alteration of circumstances ; while for others enjoying more leisure, and professing to aim at greater accuracy, the *tools* have often been of a description rather fitted for exhibition in the maker's shop than for actual work in the field. Fortunately for us, scientific men are rather eager than otherwise in lending their aid on these occasions, if they perceive a chance of their ideas being carried into effect ; and if geographers and travellers will but show a greater desire than hitherto to go to work effectually, they may rest assured of receiving every aid.

And here I should remark, that even those useful marine instruments the quadrant and sextant, admirable as they certainly are, still



admit of improvement for naval purposes. It is well enough for the commercial and motive powers of navigation to observe only the sun and moon, but for the wants of geography circles should be used instead of sextants, and stars in place of the sun; and in adapting the subjects of observation at sea to geographical purposes on land, it must be remembered, that while observations of altitude afloat are capable of less accuracy than any other, it is quite the contrary on shore: so that, although longitude by lunar distances is the great cynosure of navigators, travellers by land have no need of them; their better way is to obtain the longitude by determining the right-ascension of the moon through altitudes off the meridian, or its declination by the same method when culminating: this will be found more easy, and probably more accurate than the others; but for those travellers who cannot acquire dexterity in the use of reflecting instruments, and whose means permit the use of larger apparatus, the recent improvements of the alt-azimuth circle are important. It may even yet be made much firmer, stiffer, and more simple and accurate: it should, while serving to obtain an approximation to the measure of horizontal angles, be unimpeachable in its altitudes, and as firmly fixable in the meridian as a transit telescope.

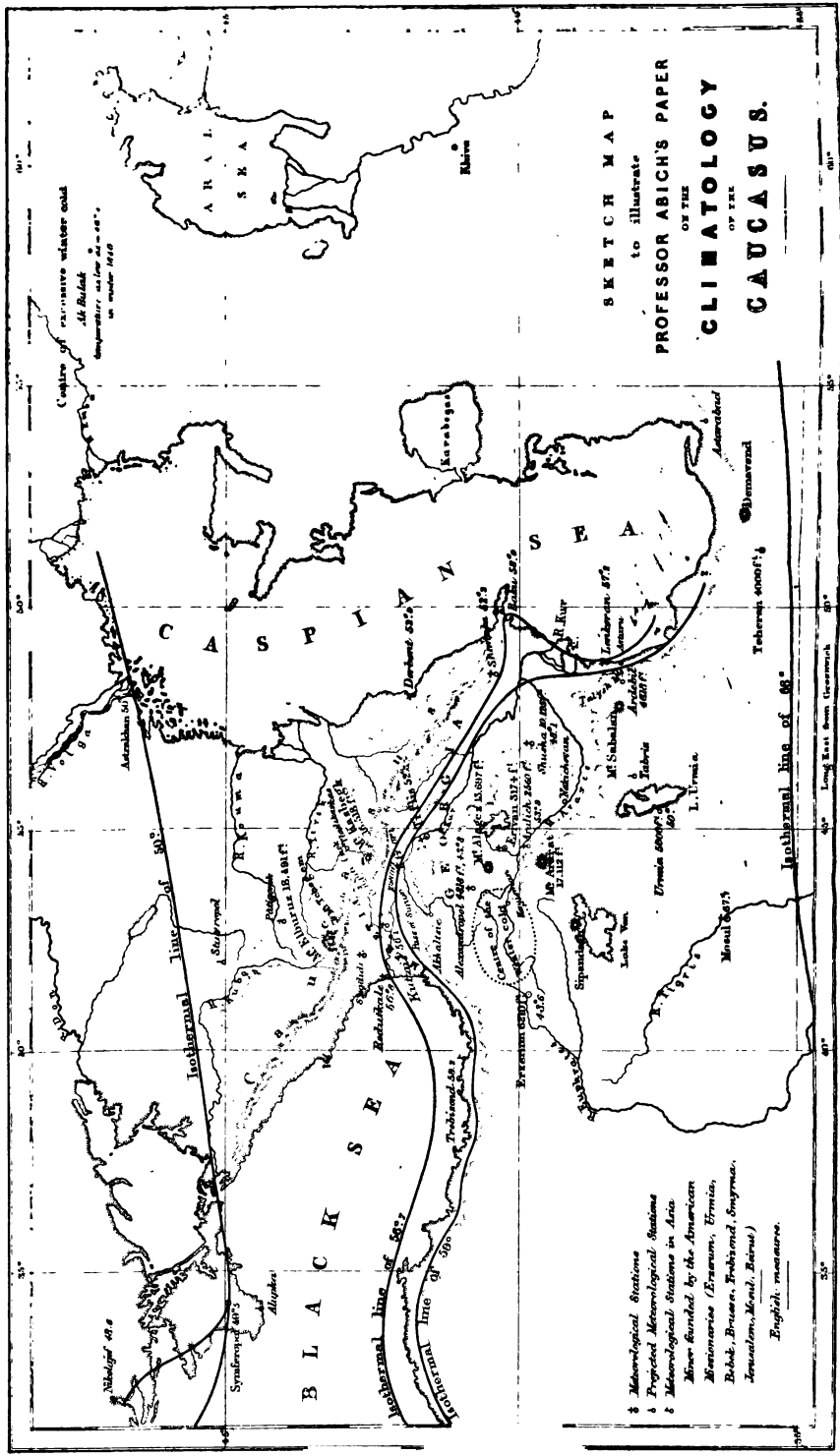
Whatever the instrument, however, or whatever the phenomena observed, my intention is to point out the direction in which the higher exertions of geographers are most required; and it might follow, that, while enriching our numerical and logical accuracy in these departments, they will also acquire more enlarged and philosophical views of the whole grand and inexhaustible subject. With the powerful means which may now be obtained, and in the true spirit recommended, travellers may hope not only to enlarge the boundaries of our geographical knowledge, but also to assist in reaching some of the most important generalizations and grandest discoveries that have ever, either in their consequences added to the material comfort of man, or so enlarged the compass of his views as to make him more worthy of his place among created beings: such are the points at which we should aim; and with such objects constantly in view, our Society will obtain and merit the esteem of posterity as well as the approbation of contemporaries.

It is now my duty to take a final leave of the station with which you have honoured me; and on resigning the post I cannot but esteem myself fortunate in having, with the aid of a zealous Council, been able to carry out some of those plans and purposes for the advancement of our best interests, the accomplishment of which I had sincerely at heart

when I ventured to undertake so responsible a charge. This satisfaction is still more enhanced when I look to my able and experienced friend Sir Roderick Impey Murchison, to whom I now resign the Chair; and than whom no one has evinced more regard for your welfare, more interest in your pursuits, or more continued application to every branch of your proceedings. Feeling satisfied, therefore, that nothing will be left undone which may ensure success, I can, with the brightest hopes for the future, emphatically say—FAREWELL!

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SKETCH MAP  
to illustrate  
PROFESSOR ABICHS'S PAPER  
OF THE  
CLIMATOLOGY  
OF THE  
CAUCASUS.

† Meteorological Stations  
 ‡ Projected Meteorological Stations  
 § Meteorological Stations in Asia  
 \* Now founded by the American  
 Missionaries (Erzurum, Erivan,  
 Baku, Brusa, Tiflis, Smyrna,  
 Jerusalem, Meul, Reims)  
 English measure.

# PAPERS READ

BEFORE THE

## ROYAL GEOGRAPHICAL SOCIETY.

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I.—*Remarks upon the Country between the Caspian and Black Seas.* By Professor H. Abich.

Communicated by Sir Roderick I. Murchison.  
[Read Jan. 13, 1851.]

THE extraordinary diversities of climate that occur in the countries situate between the Euxine and Caspian seas depend so much on their geological and orological configuration, that before entering upon that subject, it seems indispensable to lay before the Society a general account of these countries, in which I have been officially employed during several years as an exploring geologist.

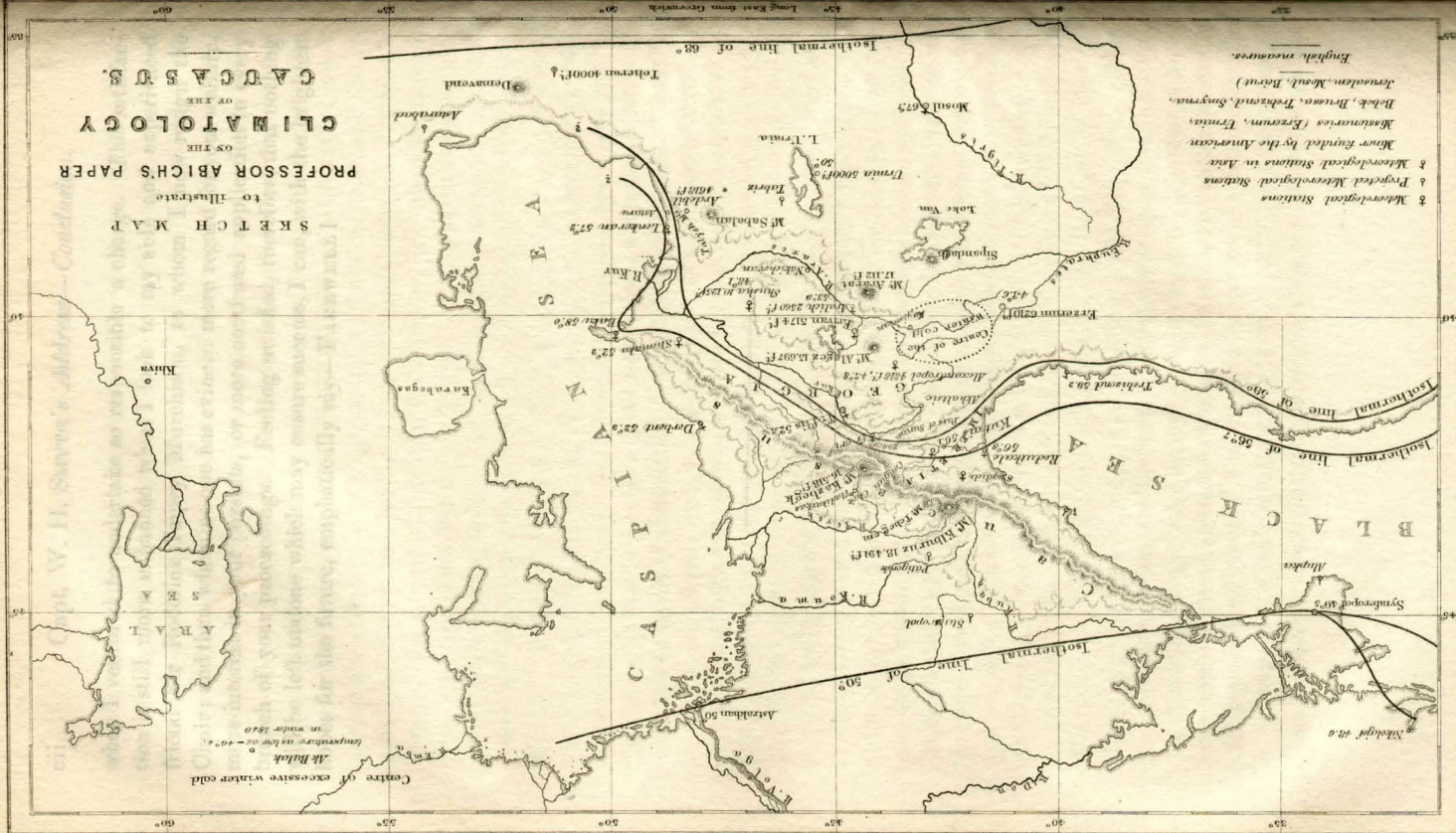
From observations made by Mr. Tchihatchef during the winter of 1829, it appears that in the low steppes between the Caspian and the sea of Aral, the mercury in his thermometer sunk nearly as low as the freezing point.

The Caucasian chain, rising like an island from a low plain almost as level as the sea, forms a continuous barrier between two sea-basins occupying each an area of from 14,000 to 15,000 square leagues.

The counterscarp on the N. is formed by a gently sloping glacis, often richly wooded, and terminating in abrupt and perpendicular cliffs from 2000 to 4000 feet high. It comprehends various geological formations, beginning at the youngest tertiary, and ranging through chalk, green sand, and oolite. In the north-western half of this chain we find granite, gneiss, and crystalline slates, traversed by dykes of diorit, Labrador porphyry, and melaphyr; in the south-eastern, principally slate, rising occasionally into rugged peaks to a height of 15,000 English feet above the sea. In latitude  $61^{\circ} 30'$  (or  $43^{\circ} 50'$ , reckoned from Greenwich) is the mountain mass called Conguti Chock, which abounds in metallic lodes; here the central chain affords a series of long elliptical valleys, bounded by huge rocky walls, except where the rivers Naridon, Terek, Assa, Argun, and Sulak\* have forced for

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\* In Koch's map of the Caucasus, the Dundut, Uruch, Tscherek, Psergamussu, Smeika and Urasdon, Ardon, Fiagdon, Absek, and Assai; several of which flow into the Terek.—Ed.



SKETCH MAP  
 to illustrate  
 PROFESSOR ABICH'S PAPER  
 ON THE  
 CLIMATOLOGY  
 OF THE  
 CAUCASUS.

- 1 Meteorological Stations
- 2 Projected Meteorological Stations in Asia
- 3 Meteorological Stations in Asia
- Minor Stations by the American Missionaries (Erzerum, Tiflis, Baku, Brussa, Trebizond, Smyrna, Araden, Meaul, Birm)
- English measures.

Centre of excessive winter cold  
 at Batak  
 temperature as low as  $-40^{\circ}$   
 in winter 1840

Prof. W. H. Sawley, Major, Cavalry  
 of the 1st Cavalry  
 for the Caucasus  
 in 1840

Long East from Greenwich  
 60° 20° 40° 60° 80°

35° 40° 45° 50° 55° 60°

## 2 ABICH on the Country between the Caspian and Black Seas.

themselves an exit northwards. Of this phenomenon, so important both in a geological and ethnological point of view, I have given a detailed description in Vol. VII. of the Bulletin of the Academy of St. Petersburg—it is strictly analogous to what takes place in the Andes.

In the tract that intervenes between the central chain and the counterscarp occur three great volcanic regions, each independent of the others. Their names, as we proceed from S.E. to N.W., are, 1. Kasbegk; 2, Tchegem; 3, Elbouruz. The high secondary ridge above mentioned on the N. of the chain is intersected by several deep transversal gorges, and presents a number of bastions; the highest of these, the famous Schachdag, which is of dolomit, abounds in *ostrea macroptera*, *terebratula depressa*, and ammonites. It attains the height of 13,800 feet, and is covered by perpetual ice and snow.

The shape of this mountain is referable to two great parallel faults, the one ranging from N.W. to S.E.; the other from E. to W., slightly affected here and there by a third, running in the direction of N.E. and S.W.

Such is the structure of Caucasus on the N.

On the S. the slope is very irregular, extending over the flatter and undulating region of Georgia Proper, the orological relations of which are still regulated by the three faults above mentioned. The dislocating and upheaving forces have here produced great variety in the rocks. Amygdaloidal beds of peculiar character were here thrown up at the same time that the fossiliferous beds on the N. of the Caucasus were deposited apparently in a tranquil sea.

The hydrographical communication of the Euxine and Caspian on the S. of the Caucasus is interrupted by an elliptical patch of granite, which, stretching in a direction from N.E. to S.W., interferes towards the S. with an extensive group of mountain land, which runs W. and E., following the course of one of the great faults. This granitic ridge, by Strabo denominated the knee of Caucasus, is often intersected by erupted rocks, and overlapped by different sedimentary formations, ranging from the upper oolitic to the miocene. Here is the native country of the Meské or Moské of the ancients; it divides Colchis from Iberia, the woody and marshy flats of the Phasis from the flat dry valley of the Cyrus, or Kur. Though at the pass of Suram its absolute height does not exceed 2980 feet, it has an extraordinary effect upon climate. By the junction of the Meske ridge with the lateral chains of Trialethi and Somsethi, which separate the pachalics of Achalzie and Imeritia, the Caucasian mountains are brought into immediate connection with the elevated volcanic tract of the sources of the

Cyrus and Araxes, viz. the highland of Ardahan, and the culminating ridge of the Taurus, S. of Erzeroum, on the W.; and on the E. with the bifurcating chains of the Pambak and the metalliferous ranges of Armenia, which, separating the Araxes and Cyrus, take, like the Caucasus, a south-eastern direction. For this reason probably the old Armenian geographers gave to the whole of these chains the appellation of Lower Caucasus, which, however, is geologically very different from the upper.

A vast series of palæozoic limestones, Devonian slate, and carboniferous limestones (of all which not a trace has yet been discovered on the Caucasus), forms the basis of an extensive range of highland, which, varying in altitude from 2560 to 4800 and 6400 feet, stretches westward into Asia Minor, and south-eastward into Persia. The palæozoic beds, on the contrary, in whatever position they may be found, whether horizontal, or inclined, or contorted, trend uniformly to the N.E. This highland, which in the chain of Karabagh\* attains a height of 12,250 and 12,800 feet, is bordered or traversed by systems of parallel subordinate mountain chains, which conform always to one or other of the above-mentioned axes of dislocation. The rocks composing it are proved by their fossil contents to belong to various formations, including the Devonian and carboniferous groups, the cretaceous, and nummulitic, but they received their actual trend from the intrusion of crystalline rocks at a relatively recent period. It was volcanic agency, however, in its most energetic development, which, at a still later period, gave to these highland regions their peculiar feature, and stamped upon them those remarkable physical characters by which they differ essentially from the Upper Caucasus.

In the Upper Caucasus the volcanic heights of Kasbegk and Elburuz, 16,520 and 18,475 feet, appear as lofty peaks in the midst of the mountain range, having forced their way through a wildly-broken surface presenting a succession of abrupt ridges and deep valleys.

On the Armenian highland, or Lower Caucasus, where the surface is more uniform, we find, on the contrary, large isolated domes, low cones, with rounded edges and gentle declivities; we find numerous craters, from which have issued enormous streams of lava, which, descending into the valleys, have filled them up to the height sometimes of 300 or 400 feet, and this to the extent of more than 15 miles. All these volcanic hummocks are referable to two parallel lines of disturbance, that traverse the whole country in the same direction as the Caucasian range, viz.

\* The Dalydag, composed of trachytic porphyry, 11,690; the tops of the Tuchtikan 11,800, on the N.E., of quartzose porphyry; and the Kapulehigidag, 12,840, fifty wersts from Nachitschevan, in the south-eastern range of the Karabagh Mountains.



#### 4 ABICH on the Country between the Caspian and Black Seas.

from N.W. to S.E. The upper one commences northwards, in the midst of the trachitic domes and cones, from 9,000 to 10,000 feet high, on the W. of Achalzie,\* which has been famous from the earliest period for the intense cold of its winter season. On the S.E. it reaches the Sabalan, near Ardebil, the height of which probably exceeds 15,000 feet, and further on the Demavend, N. of Teheran, 15,000 feet. Throughout the whole range, of about 470 geographical miles in length, we find an almost uninterrupted line of great volcanic vents, which have, at some time or other, filled up the pre-existing valleys, so as to change them into shallow basins, or to create lakes, by barring up the outlets of the waters that traversed them. Over extensive areas the older rocks are covered by flat-vaulted, volcanic platforms of 8000 to 9000 feet mean elevation, traversed by conical craters; the highest of these are the doloritic under cone of Agmangan, 12,800 feet high, the huge obsidian and pumice cone of Agdag, 12,300, and the flat dome of Alagez, 13,063 feet. The second volcanic parallel is situate in the north-western prolongation of a line drawn through the two summits of the Ararat (17,500 and 13,123 feet high) to the peak of Koezedag. It comprehends the Parlydag on the great Sinak, remarkable for the beauty of its outline, and attaining the height of 10,600 feet.

The interval between those two parallel series of volcanic heights is occupied by the famous plain of Araxes, a long, wide, and flat basin of 2560 feet mean absolute elevation, surrounding the foot of Ararat, where the eye, carried along the outline of the encircling mountains, meets a gentle slope; steep declivities occurring only where the volcanic formation is interrupted by out-cropping sedimentary or plutonic rocks. These short outlines of the Caucasian geography will render it sufficiently obvious that every meteorological agent will, in these regions, exert a variously modified influence, giving rise to a great number of like climatological conditions.

To this statement a graphical expression is given by the lines of perpetual snow. The highest point at which snow disappears in summer on the Upper Caucasus is 12,040 feet on the Schagdag,† but 10,980 on Elburuz. In the Lower Caucasus this point exceeds even 13,900 feet on Ararat. Hence it appears that the whole mountain region of the Lower Caucasus, with the exception of Ararat and Alagez, loses its snow in summer, and the difference between the utmost limit of the snow line in the

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\* Pozchonday, Dochus-ponar, Tilil 820, Ytchtapatar 9786, Elikli 10,020 feet,

† On the top of Tschalbudzag, which is the second height of the cistern called Schagdag, I met only with dispersed patches of snow at an absolute elevation of 12,050 feet.

Upper and the Lower Caucasus may be estimated at from 1600 to 1900 feet.

As I can merely offer a brief sketch in this communication, I shall confine myself to pointing out a few of the chief peculiarities of our Georgian climate which are of general interest, and relate to some questions of physiological importance to the inhabitants, prefacing the subject by some explanatory remarks with reference to the Table I.

A system of meteorological observations, established, under the direction of Prince Woronzof, by myself on both sides of the Caucasus, from the shores of the Black Sea to those of the Caspian, in connection with the central magnetical and meteorological observatory in Tiflis, has for several years furnished complete series of contemporaneous observations, made with good instruments, and carefully compared between each other. The chief results of two years observations have been calculated for 12 places in Georgia.

These observations have shown that the isothermal zone of 57° and 59°, after having traversed the land between the Caspian and the Black seas, is inflected abruptly to the S., when it reaches the Caspian. Hence it results that the annual temperature at Redutkale, on the Black Sea, of 37°. 5, is found again in Lenkoran, 3° more to the S., and the temperature, 58° of Kutais, occurs again in Baku.

The mean annual temperature of Tiflis, of which the elevation is 1385 feet above the level of the sea, is reduced to 55°. 4.\* Tiflis is included in the above mentioned isothermal zone between 57° and 59° (Table I.).

In connection with this equality in the mean annual temperatures, there is now an extraordinary discrepancy between the mean temperatures of the seasons in the before mentioned places.

This unequal distribution of absolute temperature imparts to the climate of Georgia that particular character of astonishing variety, which is the principal source of the riches of the soil.

The winters in Lenkoran are proportionally colder than those of Kutais and Redut, and in the year 1848 this difference was tripled; but the summer and harvest-time are warmer in Lenkoran and Baku than in Redut and Kutais. With reference to the cold of the winters in Lenkoran, I may state that the self-registering thermometer indicated there, during a fortnight in January, a series of minima, of which the mean was 22°, but the extremes were 11° and 13°. In the very extreme winter of 1844 to 1845, the space between the isle of Sari and the shore of Lenkoran, 2 English miles wide, was covered with ice thick

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\* 52°·9 in Map.—Ed.

## 6 AVICH on the Country between the Caspian and Black Seas.

enough to allow a communication for walkers between the shore and the isle. For two months sledges were used in Lenkoran. The water-fowl migrated to Astaru, 10 miles to the S., where the air was milder. At the same time the self-registering thermometer at Erivan marked, in the course of one week thrice,  $-24^{\circ}$ . 2. in the same place where, 4 months later, in May, I observed  $98^{\circ}$ . 1 in the shade; the vapour dissolved in the air being only 18 per cent. The greater part of the famous trees of *Juglans regia*, aged more than 18 years, perished in the fruit-gardens of Kagismann on the Araxes, 4370 feet high; but the forest-like shrubs of *laurus nobilis*, in the neighbourhood of Kutais, in Imeretia, remained uninjured during the same winter.

When the culture of the sugar-cane, which is frequent between Astrabad and Masenderan, was tried near Lenkoran, it was not suspected that that place, situated under the same parallel as Palermo and Smyrna, with their annual warmth of  $61^{\circ}$  to  $63^{\circ}$ , had only the annual and summer temperature of Montpellier, and often the winter temperature of Trier and Maestricht. (Table IV.)

It is this irregularity in the distribution of annual temperature, effected by the overpowering influence of the continental air, which determines the strange character of that vegetation, which covers the mountains of Talysch and the plains stretching at their bases. The principal kinds of shrubs and of evergreen trees, which give a peculiar charm to the forests of Imeretia and Mingrelia—the rhododendrons, the lauro-cerasus, the azalias, the jasmins—shun the cold and snowy winters of the upper Talysch and the shores of Lenkoran. The strong summer heat and the excessive moisture of those regions, produce and protect that celebrated summer vegetation, consisting of plants which are only annual, and which die every year after having borne their seeds.

The quantity of water produced by snow and rain in Lenkoran varied in two years between 52 and 40 inches; the mean annual quantity of vapour diffused in the air remaining nearly constant 82 per cent. A climatological comparison between Lenkoran and Baku,  $2^{\circ}$  further to the N., presents us with the interesting fact, that the moisture of the air being there nearly equal to that of Lenkoran, the summer is warmer and the winter is regularly milder, but the quantity of water furnished by the atmosphere is five times less than at Baku.\*

These facts result evidently from the following circumstances: the nearly insular position of Baku, the vicinity of the great hot and dry plain of the Kur, whose insolation is favoured by an

\* Taking the total quantity of rain fallen in the year 1849 at Baku, and considering it as unity, we have the following proportions:—rain and snow fallen at Alexandropol, 2.23; Derbent, 2.50; Lenkoran, 5.11; Kutais, 6.85; Redutkale, 7.36.

almost clear sky ; the great capacity of that hot air for containing vapour, the predominance of a strong and little interrupted wind blowing from the leaside, and particularly the distance of high mountain chains, and the absence of wooded hills, capable of exercising an energetic influence upon condensation. The zone of frequent rains terminates on the southern border of the great Kur-plains, where the most remote undulations of the Talysch chain cease to be wooded, whilst the frequent traces of a former considerable cultivation on the famous steppe of Muganly, between the Araxes and Kur, betray the unfavourable change by the climate of those regions has undergone in historical times by the destruction of woods, caused by the nomadic tribes, who have from the earliest times disputed those wide and fertile pasture-grounds.

By conditions like these the Caspian part of Georgia is now made to furnish an extraordinary contrast with the wooded and humid plains of Imeretia and Mingrelia, and the notable difference of agriculture and industrial development between those regions is the result of a physical necessity. It is the powerful action of predominating warm westerly sea-winds ; it is the north-western direction of the Caucasian chain, and its increasing size and height within the meridian of Elbouruz, together with the relative position of the chain of the Meskian mountains, mentioned before, which protect the deeply enclosed Colchis against the aggression of the easterly extremes of cold, so far that high-stemmed citron and orange-trees at six hours westerly distance from Poti are to be found in beautiful luxuriance sheltered by insignificant wooded hills against the northerly winds, called in that land the winds of Suanetia.

The mean annual quantity of moisture of the air (or the relative humidity) is found in Redutkale 75 per cent. During the winter the wind changes, and, becoming a land-wind, the air is much drier. There is no place in Georgia where rain and snow produce a greater quantity of water than in Kutais and Redutkale. In 1849 these quantities were 52 and 66 inches, only half of that which is annually observed in certain places in the N.W. of England.

From the foregoing observations we may assume that the five places just described represent the climatological type of the two great physical divisions of the lowlands on the S. of Caucasus from one sea-basin to the other—divisions which Nature herself has established by erecting the wooded heights of Suram 3050 feet, Laooni 6180, and Pyranga 5220, as a natural barrier which divides the climates in an extraordinary manner. Towards the W. we observe the distinct influence of southern Europe, namely, the climate of isles and western shores with mild winters and

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temperate summers; towards the E. that of continental Asia, with severe winters and hot summers.

The Karthalinian country, represented by Tiflis, occupies a very important intermediate position on the eastern slope of the climatological barrier just mentioned, for there is no other region in Georgia where the opposed influences from the W. and the E. tend to neutralize each other in a more favourable manner. Besides, in Tiflis, from its more inland position, the increasing influence of the continental air is still sensible. Hence the difference between the summer and the winter temperature in Tiflis; Baku and Lenkoran is the same, and equals that in Petersburg and Abo; whilst that of Kutais and Redut is like that in western Germany (Table II.). The mean winter temperature in Tiflis is  $34^{\circ} 4'$ ; that of summer,  $74^{\circ} 5'$ . The mean annual humidity of the air is 67 per cent., and the quantities of snow and rain amount only from 14 to 16 inches.

When we approach the high lands of the Armenian mountains, the continental character of the Georgian climate, as marked by extremes, is found to increase in a very rapid manner; the remarkable climatological character of the country, of which Ararat forms the centre, is now, for the first time, demonstrated by exact and comparative observations, made at the foot of Ararat, in Aralish, in Erivan, and Alexandropol, and cleared from the obscurity of previous erroneous valuations (Table III.). It is a fact of importance, in explaining the admirable physical economy of Armenian nature, that we meet with the summer temperature of Messina, of Baku, and of St. Croix on Teneriffe, at the foot of Ararat at the absolute elevation of 2560 feet, and recognize the winter temperature of the North Cape here in  $24^{\circ}$ , where at a height of 4160 feet the old and celebrated vineyards of the unfortunate Arguri were destroyed in the year 1840, not by the extreme cold of winter, but by a formidable natural phenomenon. It is no less unexpected to find Alexandropol, by the range of its temperature in different seasons, brought into the closest analogy with the St. Lawrence in Northern America.

SEASONS.	ST. LAWRENCE.	TORONTO.	ALEXANDROPOL.
	Lat. $44^{\circ} 40'$ , Long. $77^{\circ} 23'$ W.	Lat. $43^{\circ} 40'$ , Long. $79^{\circ} 22'$ W.	Lat. $40^{\circ} 47'$ .
Winter . .	19·60	25·43	20·30
Summer . .	65·99	64·63	66·02
Spring . .	42·17	42·34	42·80
Autumn . .	45·20	46·81	47·12
Year . .	43·20	44·81	43·83

The excessive winter temperature of Alexandropol, lat.  $20^{\circ} 3'$ , which is that of Eyafjardar, in Iceland (latitude of  $65^{\circ} 40'$ ), is explained by the peculiar position of that town, elevated 4980 feet, in the centre of those extensive Armenian highlands covered with numbers of flat dome-shaped elevations of volcanic origin, of 110 to 130 English miles in circumference, and of the absolute height of 11,000 to 13,000 feet; a region which, very early in the year, changes from grass-covered, alpine mountains, intersected by cultivated plains like valleys, into one immense undulating snowfield, stretching itself far beyond Erzerum into Asia Minor. It is the seat of excessive wintery cold, like that on the depressed easterly steppes between the Caspian and the sea of Aral, where Mr. de Tchihatchef observed— $31^{\circ}$  Fahr. in the winter of 1840.

In relation to the intensity of wintery cold we find another peculiarity of the steppes recurring on the plains of the Armenian highlands in the great dryness of the air. The greatest dryness of the atmosphere anywhere tested by hygrometrical observations was found by Humboldt, in the Asiatic steppes of Glatoffskaya, to be 16 per cent. This hygrometric state of the air I have in my numerous excursions over Armenia found to be a very frequent one, but I never observed a greater relative dryness than 17 per cent. in the neighbourhood of Ararat.

The intensity of the evaporating power of the air there is so strong, that I have, in the hottest period of the day, often observed differences between the dry and wet thermometer of  $22^{\circ}$  to  $27^{\circ}$ , and sometimes even  $29^{\circ}$  Fahr. in the shade. This evaporating power of the dry air is a physical circumstance of far greater importance to human health than I could ever have believed before a long course of practical experiments, obtained by constant comparison of the dry and wet thermometers in regions of very dangerous climatological conditions, taught me this practical truth, that the human body, being fairly comparable to a sensitive hygrometric instrument, it is much more important to know the amount of the loss of caloric by evaporation indicated by the wet thermometer, than the equivocal observations of temperature made with the common dry thermometer.

The currents of cool air from the high mountain regions towards the plains being the strongest when the insolation of the latter reaches its maximum, the evaporating process is materially accelerated, and is most intense on the inferior slopes of the mountains during the afternoon. Taking the total amount of all the winds in each month at 1000, the relative frequency of the winds in the summer of 1849 was at Erivan as follows:—

10 ABICH on the Country between the Caspian and Black Seas.

Months.	Predominating Wind.	Relation between W. and E.	Hours of the greatest Dryness of the Air.			
			Hours.	Dry Thermometer.	Wet Thermometer.	Mean Relative Humidity.
January . .	N.E. = 468	W. : E. = 1 : 3·2	Hora 4 =	76·9	55·22	0·39 p.c.
July . . .	N.E. = 673	W. : E. = 1 : 8·8	Hora 6 =	82·7	58·35	0·37
August . .	N.E. = 486	W. : E. = 1 : 3·5	Hora 2 =	86·2	62·00	0·41

Every one, but especially the foreigner from the N., by incautiously exposing himself with too light clothing, particularly during perspiration, to the action of these refrigerating processes, much as they may be disguised by the hot temperature of the ambient air, is always in imminent danger of contracting a burning nervous or bilious fever of rapid and deadly course. I witnessed so many sad proofs of this, that I am convinced that it is rather the rule than the exception. The best mode of recognizing these meteorological conditions is to observe the difference between the dry and wet thermometer, and the surest method of avoiding their dangerous influence is to have a sufficient addition of clothes at hand, and carefully to apply it, so as to prevent the intense and accelerated loss of caloric which the cutaneous system would undergo by evaporation. Being convinced that it was by attention to these practical rules, which I was taught by the continued observation of the psychrometer during my travels of many years in a land of the greatest climatological discrepancies, that I must attribute my having always escaped the pernicious influence of the climate to which I was frequently exposed, it seemed to me a matter of duty to submit my own experience to the attention of those who are visiting other foreign continental regions, in which the daily differences between the dry and wet thermometer will present them with contrasts similar to those which occur in the Armenian highlands.

When more frequent use of the psychrometer shall have furnished us with a greater number of hygrometrical observations made in the higher regions than we now possess, they will be found of great value for comparative climatological and more minute physiological inquiries regarding the connection between our atmosphere and the development of organic life.





12 ABICH on the Country between the Caspian and Black Seas.

Table II.

*Difference between Winter and Summer, 1848.*

Tiflis. 43·54	Redutkale. 32·28	Kutais. 36·37	Lenkoran. 42·53	Baku. 41·54	Schuscha.
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*Difference between Winter and Summer, 1849.*

Tiflis. 35·78	Redutkale. 27·61	Kutais. 29·90	Lenkoran. 34·23	Baku. 36·86	Schuscha. 35·0
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*Difference between Winter and Summer, 1850.*

Tiflis. 35·78	Baku. 33·86	Aralich. 45·56	Alexandropol. 45·72
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Table III.

Seasons.	Lat. 40° 47'. Alexandropol (1849). 4818 feet.				Lat. 39° 42'. Aralich (1849). 2598 feet.		Lat. 40° 10'. Erivan (1844-45). 3167 feet.		Schuscha. 3867 feet.	
	Temperature of the Air.	Humidity Absolute.	Humidity Relative.	Rain and Snow.	Temperature of the Air.	Rain and Snow.	Temperature of the Air.		Temperature of the Air.	Rain and Snow.
Winter . .	20·30	..	0·86	2·237	31·56	0·	19·3	..	29·78	0·
Spring . . .	42·80	..	0·73	5·762	54·45	0·	53·4	..	45·50	5·171
Summer . . .	66·02	..	0·58	5·822	77·02	1·105	76·3	..	64·90	9·375
Harvest . . .	47·12	..	0·72	3·234	52·94	0·130	57·2	..	48·17	3·890
Mean . . .	43·68	..	0·72	18·094	53·90	..	51·6	..	48·17	..

English measures.—Ed.

Table IV.

Seasons.	Lenkoran. 38° 44'	Palermo. 38° 7'	Montpellier. 43° 18'	Trèves. 49° 46'	
Winter . .	38·16	52·5	44·4	36·1	
Spring . .	55·9	59·0	56·6	50·	
Summer . .	76·8	74·3	75·9	64·	
Harvest . .	62·1	66·2	60·9	50·1	
Mean . .	57·2	62·9	59·	50·	

II.—Note from Captain OWEN STANLEY, R.N., F.R.G.S., to the Secretary of the Royal Geographical Society, with a Letter from the Master of the "*Freak*," and a Report by Mr. MACGILLIVRAY, the Naturalist to the Expedition.

[Read January 27, 1851.]

H.M.S. "*Rattlesnake*," Cape York, Oct. 16, 1849.

MY DEAR SIR,—I have been so much occupied since we arrived here in getting the charts finished, that I have only time to write a few lines to say that we arrived here on the 2nd, having completed the examination of the *Louisiade* Archipelago, and the S.E. coast of *New Guinea*, a tracing of which will be forwarded to you.\* The most remarkable feature we saw was a high range of mountains extending from the *Cul de Sac de l'Orangerie* to *Redscar Point*, a distance of nearly 200 miles, some of the peaks of which were more than 10,000 feet above the level of the sea, and one as much as 12,800. I did not see any openings in the coast large enough to be considered as the entrances of a river, but from the nature of the country I think it very likely that rivers of considerable extent may exist in the interior, and reach the sea by numerous small channels.

All the land both in *New Guinea* and the *Louisiade* is remarkably fertile, and very thickly inhabited; but I did not see amongst the natives many articles which would be of value in a commercial point of view, and their treacherous disposition would render it very dangerous for small traders to put themselves in their power.

I enclose a letter from Mr. Simpson, master of the brig "*Freak*," giving an account of his proceedings in search of the body and papers of the late Mr. Kennedy. I have visited the tomb on *Albany Island*, and intend to erect a slab to the memory of those buried there.

Yesterday we had the satisfaction of rescuing a countrywoman from the natives, with whom she had been residing four years. She was wrecked on a small island N. of *Cape York*, and all the crew were drowned; she alone was saved by the exertions of the natives. As she appears to be a most sensible person, and thoroughly conversant with the native language, I hope to obtain much valuable information from her.

I also enclose a report from Mr. MacGillivray (the naturalist attached to the expedition) on the plants, animals, fishes, &c., that he found in his researches in *New Guinea* and the *Louisiade*.

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\* See Map just published by the Hydrographic Office.—ED.

COPY of a LETTER from J. B. SIMPSON, Esq., Master of the brig "Freak," sent by the Colonial Government at Sydney to search for the Papers connected with the late fatal Expedition under Mr. Kennedy. (True copy, O. S.)

Brig "Freak," at anchor off Albany Island, May 15, 1849.

MY DEAR SIR,—According to my promise I give you a summary of my proceedings in the "Freak," when looking for Kennedy and his papers.

I called at Weymouth Bay, and went to the camp there, but found everything destroyed. Found some pieces of books, &c., but no manuscripts of any kind. The specimens of natural history were all destroyed. I got part of the remains of Wall and Niblet—their skulls and a few other bones—which I took on board. I saw also some natives armed with spears, who immediately decamped on seeing our formidable party. We then proceeded to Shelbourne Bay, and thoroughly examined the coast in the whale-boat from Round Point to Port Albany, landing frequently, but finding nothing, with the exception of a pistol-holster in a canoe not far from Jackey's Pudding-pan Hill.

Traced the Escape River to its source, a small fresh-water stream about 12 or 13 miles from the entrance; in fact it is not a river, but only an estuary. Jackey found the place where he had left the saddle-bags, but the natives had taken them. The horizon-glass of a sextant was found at the spot.

Jackey took me to the place where poor Kennedy was speared and where he died, but we searched in vain for his remains for upwards of three hours; he was buried in a dense tea-tree scrub; the soil was light and sandy, and the small mound Jackey made over the grave had been washed down by the heavy rains. I am of opinion that the body had not been exhumed. We got a bottle of quicksilver and a Kater's compass which Jackey had concealed. The natives all fled from us, and in one of their camps we found a small piece of red cloth, which Jackey recognised as part of the lining of Mr. Kennedy's cloak.

A river which runs into the centre of Newcastle Bay was next examined, and the place found where Jackey had concealed the small papers in a hollow log, but a rat or some animal had pulled them out, where they had been exposed to the weather and were quite saturated with water. They consisted of a roll of charts on which his track was laid down: these with care may possibly be deciphered; I am sure if *you* had them you could do it. There were some memorandum books much defaced, and also a time-book. I have sent everything carefully packed to Sydney.

I scraped over a shoal patch with about 11 feet on it at half flood, while standing in to pick up my boat. The shoal bears nearly as follows:—The outer or Large Hannibal Island S.E.  $\frac{1}{4}$  E.; the inner, only a solitary tree above water, S. by E.  $\frac{1}{4}$  E. This is a very dangerous patch of small extent, and is not visible from aloft.

I buried the remains of Wall and Niblet on the highest part of the S. end of Albany Island, where I got the following bearings:—

A rock just open on the side of a hill on the N. end of Albany Island, S. 147° W.; the North Brother, N. 58° E.; Fly Point Main-land, S. 1° E.; Tree Island just visible over the top of the hill, S. 146° W. This spot would be an excellent place to erect a monument in memory of the unfortunate individuals who perished on the ill-fated expedition.

I caught the horse left by the "Ariel" with some difficulty, and have got him on board.

The weather has been very unsettled, blowing hard with heavy rain. Allow me again to thank you for your kind offices, and believe me,

My dear Sir, yours faithfully,

(Signed)

J. B. SIMPSON,

To Capt. Owen Stanley,

Master of the brig "Freak."

H.M.S. "Rattlesnake," Booby Island.

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SKETCH of the NATURAL HISTORY of such portions of the *Louisiade* Archipelago and *New Guinea*, as were visited by H.M.S. "Rattlesnake," June to September, 1849. Communicated to Captain OWEN STANLEY, R.N., by JOHN MACGILLIVRAY, Esq., F.R.G.S., Naturalist to the "Rattlesnake."

#### *Louisiade Archipelago.*

1. *Geology*.—At all the portions of the group where a landing was effected—with the exception of the low islands of coral formation—the rock was found to consist of mica slate, varying so much in character as often to resemble chlorite slate, or schist, on one hand, and talc slate on the other; indeed, in hand specimens it was often difficult to decide which of the three names was most applicable. At Coral Haven the strike was usually W.N.W. and E.S.E., but at the Watering Creek on South-East Island, where the rock stretches across the stream like a dyke, the line of direction of the beds is nearly N. and S., with a westerly dip of about 60°. This rock is frequently ferruginous and is traversed by veins of quartz. It varies in colour from a leaden hue to a shining ash grey; in some places it is so soft that it may be scratched with the nail, and in others it is as hard as roofing slate.

2. *Botany*.—The first botanical feature which struck me after landing on Pig Island was the similarity between the vegetation and that of Tropical Australia; indeed, the presence of the cocoa palm was the only remarkable point of difference. The mangroves are the same, *Rhizophoræ* and *Bruguieriæ*; the shores and sandy beaches are fringed with *Tournefortia argentea*, *Morinda citrifolia*, *Guettarda speciosa*, *Peritium tiliaceum*, and other trees and shrubs which appear to be found everywhere in similar situations in Polynesia and the Malayan Archipelago. At the Watering Creek we had an opportunity of seeing a more luxuriant vegetation—equalling in density that of an Indian jungle. Even the mangroves on the muddy shores washed by the salt water often attained the unusual dimensions of 80 feet in height and from 6 to 8 feet in circumference. Further up, *Dracontium polyphyl.*

lum clothed the trunks of the trees like ivy, and gigantic climbers hung down in long festoons from the branches overhanging the water, and the larger limbs supported great clumps of ferns and parasitical plants. The graceful areca palm appeared at intervals, with an occasional magnificent Pandanus, or a fine tree-fern of the genus *Hemitelium*, the trunk of one of which measured 15 feet in height and 8 inches in diameter. In the jungle one's progress is every now and then impeded by tough rope-like climbers and thickets of rattan (*Calamus Australis*) with recurved prickles, and other tangled vegetation. The well-known pitcher-plant of the East (*Nepenthes destillatoria*) is here plentiful among the long grass on the borders of the thickets.

The low coral islands of Duchâteau exhibited some different botanical features. There was an entire absence of herbaceous vegetation. The prevailing tree is a species of *Calophyllum*; and of many others, species of nutmeg and clove trees may be mentioned, but those attaining to the greatest dimensions are *Pisonia grandis* and a species of *Bombax*, which frequently measured from 12 to 15 feet in circumference.

3. *Mammalia*.—With the exception of a small rat (*Mus Indicus*), the only quadruped procured by us is the Papuan pig (*Sus Papuensis*), which appears to exist in great numbers in the forests of the larger islands in a wild state, and a few are also domesticated by the natives.

4. *Birds*.—With the exception of *Sterna melanauchen* and a new *Anous* with white margin to the wings, the sea-birds are mostly of widely distributed species. The reefs and shores are frequented by white and blue herons (*Herodias Greyi* and *H. jugularis*), the osprey and fishing eagle of Australia, and *Haliastur leucosternus*. In the thick brushes we found *Megapodius Duperreyi* in great abundance, and saw many of the large mounds in which it deposits its eggs. A handsome, white-headed kingfisher (*Halcyon saurophaga*) was found on the Duchâteau Islands. There appear to be a great variety of pigeons in the Louisiade Archipelago; of these the Nicobar, Torres Strait, and Oceanic-nutmeg species are the most plentiful. A very fine new *Carpophaga* with purple-and-green metallic reflections, and a *Ptilinopus* (since named *Pt. strophium*) with cream-coloured pectoral band, were also obtained. Of 16 species of birds shot on South-East Island all but three are also found in Australia. One of these exceptions is a very splendid scarlet lory, closely allied to *Lorius domicellus*, so widely spread over the Indian Archipelago.

5. *Reptiles*.—No land-snakes came under our observation, but sea-snakes—chiefly of the genus *Hypotrophis*, and highly poisonous—were of almost daily occurrence, swimming about the ship. The only lizards worth mentioning are a *Monitor* like *M. Gouldii*, and another species, of which one individual, about 5 feet in length, frequented the mouth of the Watering Creek at South-East Island, taking to the water on being disturbed.

6. *Fishes*.—Our various anchorages throughout the Louisiade Archipelago produced a considerable variety of fish. The family *Sparridae* is that best represented, and three kinds of *Pentapus* numerically more than equalled all the others. The finest and best eating fish is a

large red snapper of the genus *Plectropoma*, and the most remarkable are the species of *Holocentrum*, brilliantly coloured with scarlet or blue and silver. Many small kinds of fresh-water fishes were observed in the stream on South-East Island.

7. *Shells*.—The shells found on the coral reefs are nearly all Australian, and most of them Polynesian also: a catalogue of the names of the cones, cowries, and others found in such places, would not be of general interest. The dredge, in the few places where it was practicable to use it, produced some curious mollusca—chiefly minute species of *Mitra*, *Nassa*, *Terebra*, and other univalves. The muddy shores of a mangrove creek on South-East Island afforded numbers of a small *Auricula*, and a very fine *Cyrena*, both of which are probably undescribed. The damp forests of the same island promised to be fruitful in land shells, yet careful search produced only five species, all of them, however, new to science. The principal of them is a *Pupina* much larger than any described species; the most generally distributed is a minute *Helicina* found on leaves and trunks of trees. The watering-place at Coral Haven furnished many curious fluviatile mollusca, consisting of species of *Melania*, *Navicella*, *Neritina*, and *Mytilus*, but many of these had already been known to naturalists.

8. *Insects*.—Among the few insects collected in the Louisiade Archipelago, the most interesting is a splendid day-flying moth, *Cocytia Urvillei*, of which several individuals came on board the ship when distant from the shore upwards of a mile. A small fire-fly appeared to be plentiful, emitting at night a pale bluish-green light. The office of the mosquito, in relation to man at least, is efficiently filled by a little two-winged fly, the bite of which is followed by much irritation of the skin; and it is difficult to avoid a green ant with sharp mandibles which forms its nest among the leaves of the trees and bushes.

#### *South-East Coast of New Guinea.*

1. *Geology*.—As we landed on three occasions only on the S.E. coast of New Guinea, scarcely any opportunities of adding to our knowledge of its natural history were afforded. A specimen of rock from one of the Dumoulin Islands, procured by Lieut. Yule, is a remarkable siliceous breccia. The adjacent Brumer Island is composed of beds of volcanic conglomerate and soft tufa capped by a dark basaltic rock. From the canoes which came off to us at Dufaure Island I procured specimens of obsidian or volcanic glass, and some rounded water-worn fragments of porphyritic basalt containing crystals of hornblende. At Redscar Head and the Pariwara Islands the rock is calcareous—an elevated coral reef of great thickness, usually of a reddish colour, much decomposed on the surface, and exhibiting steep irregular cliffs. We had no means of judging of the geological structure of Owen Stanley's range, but Mount Astrolabe appeared to me to be of trap formation.

2. *Botany*.—At the Brumer and Dufaure Islands the most interesting plant is the breadfruit-tree, apparently indigenous. The flax brought off to us at the Brumer Islands—some samples of which were

as much as 11 feet in length—is probably the produce of the midrib of the leaf of a species of banana, but this is doubtful. Among the few plants of the Pariwara Islands I may mention *Pandanus pedunculata* and *P. spiralis*, a *Cleome* with yellow and a *Pongamia* with purple flower, *Convolvulus multivalvis*, *Evolvulus villosus*, *Guettarda speciosa*, &c.; but the arid soil there supports only a very scanty vegetation. Sago-palms of great size were frequently found floating in the neighbourhood of Redscar Bay, probably grown upon the banks of the large river seen to disembogue there, and groves of cocoa-nut trees were seen everywhere at intervals along the whole of the S.E. coast visited by us.

3. *Mammalia*.—Several pigs (*Sus Papuensis*) were brought off to us by the natives, and in a similar manner we obtained some live specimens of a rare and singular opossum (*Cuscus maculatus*).

4. *Birds*.—We are aware of the existence in the southern parts of New Guinea of a species of cassowary, and at least one kind of bird of paradise, having seen the plumes of these birds worn by the natives as ornaments; and some preserved heads of a hornbill (*Buceros plicatus*), strung together as a necklace, were obtained at Brumer Island.

6. *Fishes*.—The muddy nature of the bottom at our various anchorages off the coast of New Guinea seemed to be unfavourable for fishes, as scarcely any were procured by us, although the neighbourhood of the coral reefs there is probably as productive of fishes as we found it in similar localities in the Louisiade Archipelago.

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*Note*.—In a letter dated Singapore, May 2, 1851, Mr. Windsor Earl informs Admiral Beaufort that “A Narrative of the late Dutch Expedition to New Guinea has just appeared. It is, without exception, one of the best accounts I have ever met with; full of information and pleasantly told. The expeditionary vessel was on the coast of New Guinea when the ‘Meander’ passed along on her way to Sydney. This, with poor Captain Stanley’s observations on the South Coast, and M. Modera’s on the West, will make us nearly as well acquainted with New Guinea as we are with Madagascar.”—ED.

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III.—*Extract of Letter from Rev. Dr. LIVINGSTON, under date Kolobeng, 24th August, 1850. Communicated by the Rev. Dr. TIDMAN, Foreign Secretary of the London Missionary Society.*

[Read Feb. 10, 1851.]

MRS. LIVINGSTON and Mebaloe, the native teacher, had joined in my desire to visit Sebitoane; and Sechele, our chief, having purchased a waggon, the first service he wished it to perform was to place him in presence of the man who, in former years, when assaulting the Bakwain town, ordered his survivors to be sure and

spare the lives of the sons of Mocoasele (Sechele's father). The attack having been made in the dark, Sechele was badly wounded, and lay insensible till the morning. When recognised, Sebitoane gave orders to his doctors to attend to the wounds, and subsequently restored him to liberty. Had we succeeded in reaching Sebitoane, the interview between the two chiefs might have been interesting. Our chief sent a present to his former benefactor last year, but his messengers were prevented going in the same way that we were. They have been more successful this year; so, though we have not been able to go as far as we intended, we are thankful to hear that the way has been opened by them.

Having no apprehension that Sekhomi would throw obstacles in our way, we visited his tribe both in going and returning. As he is an old friend, I apologised for passing to the westward of him in our last trip, on the ground that, as I knew he was very much opposed to our finding a passage to the Lake (he having twice refused our request to pass), I had determined to go in spite of him, and yet without contention. He replied, "U'ntsitle, mi kia boka" (You beat me, and I thank you, or acknowledge it). His entire conduct was the opposite of what it was last year. We had more intercourse with the Bakalahari, especially with the inhabitants of a large village about 40 miles N. of the Bamangwato; and as we passed through their country in April, before the pools, which are usually filled by the rains, are dried up, we suffered no inconvenience from want of water. After visiting the Bakarutse, who live at the lower end of the Zouga, we crossed that river, and ascended on its northern bank. Our intention in passing along the northern bank of the Zouga was to follow the course of the Tamunakle until we reached Sebitoane, but, when near the junction of the two rivers, we were informed by a Bakhoba chief named Palane, that the fly called "tsetse" abounded on the Tamunakle. As its bite is fatal to oxen, horses, and dogs, though harmless to men and goats, and we had no more oxen than were sufficient to draw our waggons, I proposed proceeding alone; but Mrs. L. preferring to wait during my absence among the Bataoana, we recrossed the Zouga, and went down towards the lake. Sechulathebe, the chief, furnished guides, and informed us that the distance would be performed partly by land and partly by water, as the Tamunakle had a very zigzag course; that the riding ox would certainly die soon after I returned, in consequence of being bitten by the fly, and promised to furnish my family with meat during my absence, but objected to Sechele going along with me, because his messenger had not yet returned to tell how Sebitoane's mind stood affected towards him. Everything seemed favourable, and, before starting, I took my wife down to take a peep at the lake. We felt rather more curiosity



than did an Englishman who came to buy ivory from the Bataoana, for, although within six miles of it, he informed us that he had never visited it. On the day following our driver and leader were laid up by fever, and subsequently to that two of our children, and several of the people besides; a young English artist, Mr. Rider, who had taken some views of the lake scenery, and a Hottentot belonging to another party, died of it. As the malaria seemed to exist in a more concentrated form near the Ngami than in any other part, we were compelled to leave, after spending two Sundays with the Bataoana; and as the time at my command would have been spent before I could safely leave my people, the fever and the fly forced me to return to Kolobeng. I was mistaken last year in supposing the epidemic, of which we heard, to be pneumonia; there is undoubtedly a greater amount of cough on the river than at Kolobeng, but the disease which came under my observation this year was real marsh-fever. The paludal miasma is evolved every year as the water begins to flow and moisten the banks of vegetable matter. When the river and lake are full the fever ceases, but it begins again when evaporation has proceeded so far as to expose the banks to the action of the sun. Our visit was made last year when the river was nearly at its height; but the lake had now retired about 20 feet from the spot on which we stood last year; this might be about 3 feet in perpendicular height. In the natives, the effects of the poison imbibed into the system appear most frequently in the form of a bilious fever, and they generally recover after a copious evacuation of bile. In some it appears as continued fever. In a child there was the remittent form, while in two cases it was simply intermittent. In one case the vascular system of the abdomen was greatly affected, and the patient became jaundiced and died; in another there were only muscular pains and rapid decline of strength; while in several others there was only pain in the head, which a dose of quinine removed. Mr. Wilson, an enterprising trader, who had it in its most severe form, had several violent fits of intermittent fever when recovering from the other, and at a distance of 400 miles from the lake. This disease seems destined to preserve intertropical Africa for the black races of mankind. If the Boers, who have lately fallen upon the plan of waylaying travellers between Kuruman and this, should attempt to settle on either lake or river, they would soon find graves. As the Ngami is undoubtedly a hollow compared to Kolobeng, and the Teoge, a river which falls into the lake at its N.W. extremity, is reported to flow with great rapidity, the region beyond must be elevated. A salubrious spot must be found before we can venture to form a settlement: but that alone will not suffice, for Kolobeng is 270 miles by the trochameter from Kuruman, and the

lake by the same instrument is 600 miles beyond this station. *We must have a passage to the sea on either the eastern or western coast.* I have hitherto been afraid to broach the project, but, as you are aware, the Bechuana mission was virtually shut up in a cul-de-sac on the N. by the Desert, and on the E. by the Boers. The Rev. Mr. Fridoux, of Motito, lately endeavoured to visit the Ramapela, and was forcibly turned back by an armed party. You at home are accustomed to look upon a project as half finished when you have secured the co-operation of the ladies. Well, then, my better half has promised me twelve months' leave of absence for mine. Without promising anything, I mean to follow a useful motto in many circumstances, and "try again."

The following information, gleaned from intelligent natives, may be interesting, and probably is not far from the truth, as they could have no object in deceiving me. The Ngami is merely a reservoir for the surplus waters of a much larger lake or marsh, containing numerous islands, about 150 or 200 miles beyond. Sebitoane, who was defeated by the Griquas near Motito or Latakou, in 1824, lives on one of these islands. The river, which falls into the Ngami at its N.W. extremity, is called the Teoge; it runs with so much rapidity that canoes ascend with great difficulty, and when descending no paddling is required, as the force of the current suffices to bring the boats down. Large trees are frequently brought down, and even springboks and other antelopes have been seen whirling round and round in the middle of the stream, as it hurried on their carcasses to the lake. But this flow only occurs at one period of the year, and whence the increase of water in the upper lake is derived no one can tell. Other rivers are reported as existing beyond Sebitoane's district, and a large population is said to live on their banks. The names of these tribes are: Bagomae, Barovaia, Barosia, Batongka, Banambia, Banami, Bazatoa, Bachorongka, and Babiko. The people of the last-named tribe are famed for their skill in manufactures, are lighter in colour than the Bakhoba, and have longer hair and beards. All the iron used among the people near the lake comes from the N. Though the Bakhoba are much more inquisitive than the Bechuanes, I never met with one who had even heard of the existence of the sea. They had heard of a people whom we conjectured to be Portuguese, and we saw an old coat which we believed to be of Portuguese manufacture. Although we have seen the Zouga flowing and even rising considerably, the natives assert that soon after the small reservoir near the Bakurutse villages, called Kumatao, is filled by the Zouga, the latter ceases to flow, the rains do not affect it in the least, and in many parts its bed becomes quite dry. This is also the case, according to report, with the Tamunakle and Teoge. During a certain

portion of the year the beds of these rivers exhibit only a succession of pools with dry patches between them. The fishes, which we saw so abundant in July and August last year, had not descended from the N. in June. The Bakhoba seemed quite sure they would appear in the month following, and they enumerated nine varieties of them in the lake and rivers, two of which are said to attain occasionally the length of a man. Of the five varieties which came under our observation four were very good eating; the fifth, the *Glanis siluris*, had attained a length of about 3 feet. Crocodiles, or alligators, and hippopotami are also found, but the latter are now scarce in consequence of the Bakhoba frequently hunting them; they kill them by means of a large harpoon, to which a strong rope is attached, in somewhat the same manner as whalers do. They use nets made of the hibiscus, baskets, and assegais for killing fish; their canoes are flat-bottomed, and scooped out of single trees. The banks of the river are in many parts lined with trees of a gigantic growth. I observed twelve quite new to us at Kolobeng. The banyan and palmyra were recognised as Indian trees by our friend Mr. Oswell; the boabob, the body of which gives one the idea of a mass of granite from its enormous size, yields a fruit about the size of a quart-bottle; the pulp between the seeds tastes like cream of tartar, and it is used by the natives to give a flavour to their porridge. Three others bear edible fruits, one of which, called "moporotla," yields a fruit, an unripe specimen of which measures  $20\frac{1}{2}$  inches in length and  $7\frac{1}{2}$  in circumference; the seeds are roasted and eaten, and the body of the tree is used for making canoes. Another, called "motsouri," is a beautiful tree, and very much resembles the orange, but we did not see the fruit. The natives pound the root of a kind of flag, and obtain flour not greatly inferior to that from wheat in taste and appearance; this flag is called "tsitla," and grows abundantly on both lake and river. The root of a water-lily is likewise used as a vegetable, but it is not so agreeable as the tsitla. The people sow when the river has risen high enough to moisten the soil of the flats in which their gardens are situated; they do not require to wait for rain, as the other tribes must do, for they have good crops, though but little rain falls. Rain-makers are consequently at a discount among the Bakhoba. Besides the usual native produce they cultivate an excellent ground-nut.

The banks of the Zouga are studded with pitfalls, which the Bakhoba dig for the purpose of killing game. Some of these are very neatly smeared over with mud, and if a sharp look out is not kept, one finds himself at the bottom with the sand running down on him, as the first intimation of the presence of the trap; they are from 8 to 10 feet in depth, and the wild animals are so

much afraid of them that they drink during the night, and immediately depart to the desert. Elephants abound in large numbers, but previous to our first visit the ivory was of no value; the tusks were left in the field with the other bones. I saw 13 which had been thus left, and which were completely spoiled by the weather. In our first visit the Batoana would have preferred to sell a tusk for a few beads to parting with a goat for twice the amount; they soon, however, acquired a knowledge of the value of ivory. In one village the headman informed me that two of his wives had been killed by elephants entering the village during the night and turning over the huts, apparently by way of amusement. Besides elephants, rhinoceros, buffaloes, &c., we observed a new species of antelope, called "leche;" it is rather larger than the pallah, the horns in shape are like those of the waterbuck, the colour of the skin is a beautiful brownish yellow, and its habits are those of the waterbuck. Mr. Oswell has this year secured a new variety of the khooodoo.

The country beyond the Bamangwato, so far as we have penetrated, is quite flat, only intersected here and there by the dry beds of ancient rivers. The desert does not deserve its name, excepting from its want of water, for it is usually covered with abundance of grass, bushes, and trees; nor is it destitute of inhabitants, as both men and animals exist in considerable numbers. Man, however, has a hard struggle to keep soul and body together. The Bakalahari children are usually distinguished by their large protruding abdomen, and ill-formed legs and arms; the listless eye shows that youth has few joys for them. Although much oppressed by the Bechuanas, who visit them annually in order to collect skins, they are often at variance among themselves. They obtain water in certain hollow parts, called "sucking-places," where there is a stratum of wet sand about 3 feet below the surface, by means of a reed. A bunch of grass is tied round one end of it, to act as a sort of filter; this is inserted in the wet sand, and that which was taken out in making the hole is firmly rammed down around it. The mouth applied to the free extremity draws up enough of water to fill a load of ostrich eggshells. By making wells in these spots we several times obtained water sufficient for our oxen. The natives were always anxious that we should not in digging break through a hard layer at the bottom of the wells, asserting that if we did the water would be lost. The Bushmen of the desert are perhaps the most degraded specimens of the human family: those near the river Zouga look much better; the river supplies them with fish and "tsitla," and they seem expert in the use of the bow and arrow, for they have killed nearly all the lions. The Botletli are real Bushmen in appearance and language, and about twelve years ago were in

possession of large herds of cattle. We saw specimens of the horns of these cattle, which measured from 6 to 8 feet from point to point. The Bushmen are very numerous on all sides of both lake and river, and their language has as much klick as it has further S.

Of the animals which live in the desert, the eland is, perhaps, the most interesting. It is the largest of the antelope kind, attains the size of a very large ox, and seems wonderfully well adapted for living in that country; for though they do drink a little if they pass near water, they can live for months without a drop: they become very fat, the meat is excellent, and, as they are easily run down by a good horse, it is surprising to me that they have not been introduced into England. The soil is generally sandy; vegetation is not much more luxuriant, except in the immediate vicinity of the river, than in this portion of Africa generally. All the rocks we saw consisted of calcareous tufa, travertin, and sandstone. On the banks of the lake there is a rock of igneous origin. The tufa contains no shells, but the salt-pans near the lower end of the Zouga are covered with four varieties of recent shells. It is probable these flats, called salt-pans because sometimes covered with an efflorescence of salt, were reservoirs, such as the Kumatoa is now, at a period when the flow of the Zouga was greater than it is at present. The country generally is unquestionably drying up. Streams and fountains which, in the memory of persons now living, supplied villages with water, are now only dry watercourses; and as ancient river-beds are now traversed by more modern streams, giving sections which show banks of shells, gravel, and rolled boulders, it is, perhaps, not unreasonable to conjecture that an alteration in the elevation of the entire country is taking place. At present, wherever the bed of the Zouga may lead (perhaps towards the Limpopo?), water seldom flows far past the Bakaratsé villages.\*

\* In a letter since received by Dr. Shaw, Mr. Livingston says that he was disappointed in his last visit to Lake Ngami, in not receiving guides from Sebotoane, to whom he had dispatched Bakwains, asking for them to be sent to meet him on the Zouga. The fly "tsetse" prevented his proceeding alone without them. In speaking of the waters to the N. of the Ngami the natives make use of the term "Linokanoka" (River's-river) or many rivers. After his departure, several of Sebotoane's men did arrive, and offered to act as guides to Mr. Oswell, while others were sent on all the way to Kolobeng; and Mr. Livingston intended proceeding in May of the present year, in company with Mr. Oswell, on a visit to Sebotoane. These people say that they knew the *Zimbese* and another river, which runs N.W. to the sea. Some of them had gone down it to the sea on the W. coast, where they saw ships, and called out to them "Hey! Come and tell us the news!" but, they innocently added, "they did not mind us." They likewise called a large river, running eastward, the *Zambesa*. Native slave-dealers had once visited Sebotoane, who gave them many of his captives. An individual of a tribe from the N. of Sebotoane's country accompanied these traders.—Ed.

1911  
L. S. Stanford, Jr.  
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IV.—*Survey of the Southern part of the Middle Island of New Zealand.* By Capt. J. LORT STOKES, R.N., F.R.G.S. Communicated by the Admiralty. With Memoranda on its exploration.

[Read February 20, 1851.]

H.M.S. "Acheron," Wellington, Sept. 1, 1850.

SIR,—In compliance with your Excellency's, request I have the honour to forward a brief description of the Southern portion of this province, resulting from the "Acheron's" recent cruize.

In our examination of the seaboard from Otago to Preservation Harbour, a distance of 220 miles, there were found only 4 roadsteads and 1 port; and of the 23 rivers in this extent of coast line, 4 only are available for small vessels, and only 2, the Waikawa and Orete or New River, for ships of from 300 to 400 tons. The latter is of very considerable importance, since it leads to the fertile district hereinafter described, and is separated by merely a half-mile portage from the head waters of the Bluff Harbour, the last in the Middle Island, and having an available block of land within the eastern entrance of Foveaux Strait, and distant 130 miles from Otago.

Our first view of this prairie land of the Middle Island was from the Bluff, a basaltic hill of 855 feet elevation. Between the points of N.E. and N.W. appeared a large plain, of which the outline suggested the idea of a bishop's mitre, and measuring, as was subsequently ascertained, full 100 miles. Isolated patches of woodland were agreeably dotted over its surface, and a range of rugged, snow-clad mountains, the highest distant 80 miles—being 6700 feet, to which I gave your Excellency's name, terminated in that direction the prospect of this extensive landscape. Turning in an opposite direction, the eye rested on Foveaux Strait, then wearing the aspect of a tranquil arm of the sea, some 15 miles in width, with Stewart Island for its southern boundary, and numerous groups of islets occupying the space between shore and shore. Three openings in the northern hills show the course of the Aparima, or Jacob River, winding along the western edge of the plain, that of the New River traversing its central part, with the Mataura running on its eastern side.

The New River was ascended in a whale-boat for nearly 30 miles in a N.  $\frac{1}{2}$  E. general direction. In that distance the land rose gradually 200 feet, by 3 steps, each change of elevation being attended by corresponding and somewhat dangerous rapids. The depth of water varies from 2 to 8 feet, the width from 50 to 500 yards. The soil on either bank consists of a rich mould, and appeared clothed with trees or verdant pasture, as the stream

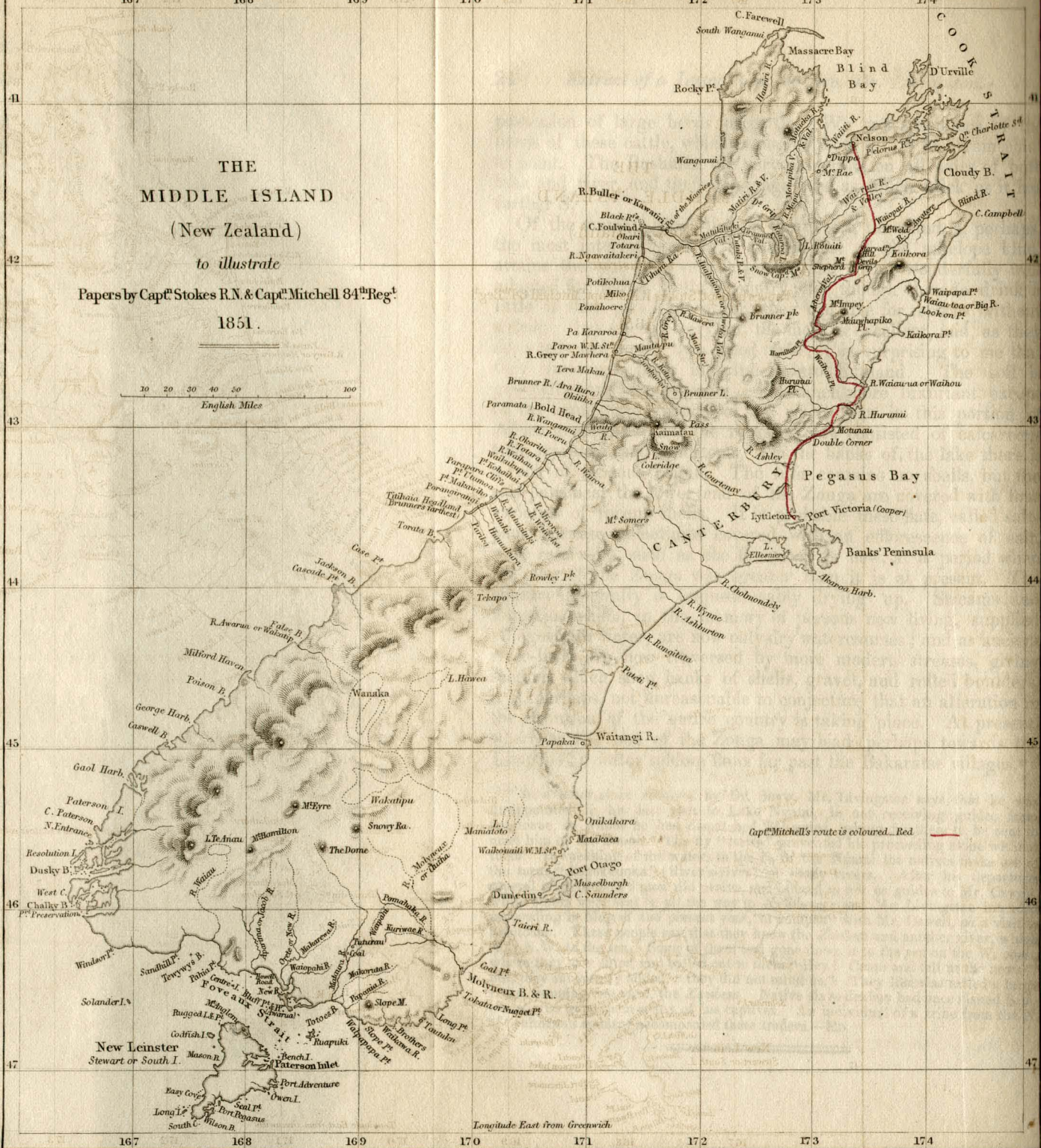
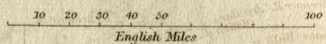


THE  
MIDDLE ISLAND  
(New Zealand)

to illustrate

Papers by Capt<sup>d</sup> Stokes R.N. & Capt<sup>d</sup> Mitchell 84<sup>th</sup> Reg<sup>t</sup>

1851.



wound through clumps of wood or swept across the open plain. The Matura and Jacob River were partially examined by Mr. Hamilton and Mr. Spencer of the "Acheron" whilst she was occupied on the shores of Stewart Island. They explored the intermediate country, and reached Otago in 16 days, each carrying 30 lbs. weight of baggage, which from unexpected accidents was frequently increased to 70 lbs., they being the first Europeans who had accomplished that journey. I extract the following passage from Mr. Hamilton's report:—

"The country westward of the Molyneux or Clutha, as far as Jacob River, offers peculiar advantages for the formation of an extensive settlement. The plain stretching eastward of the latter stream for a distance of 40 miles, comprises at least 600,000 acres of rich soil, clothed with fine grass. The timber is everywhere very equally distributed, and the district, taken altogether, seems to vie in natural advantages with the best parts of the Middle Island.

"Eastward again of this plain, a chain of densely wooded hills extend as far as Molyneux district, having towards the sea an elevation of about 2000 feet. Inland, however, they gradually decrease in height, and the masses of forest disappear altogether, giving place to the finest *pasturage*. This tract, broadest towards the S., where it meets the sea coast, has an area of from 700,000 to 800,000 acres of fertile land. The disappearance of the timber, and consequent scarcity of fuel, will prevent its subdivision into many small stations, or sheep runs. There are indeed some indications of peat or turf in this neighbourhood, which might be available as a substitute, since some patches were seen in a valley little more than half way between Tukurau and the Matura River. At Tukurau the soil has proved extremely rich, and some potatoes raised by a solitary Maori family, resident there, exceed in volume those brought by Bishop Selwyn from the Chatham Isles (9 inches each way), which were considered as the most remarkable specimens of this root grown in the southern hemisphere."

Speaking generally, the climate is very equal, although rather wet towards the sea coast, but less so in the interior, as is shown by the remarkable difference in the vegetation of these respective situations, and by Mr. Hamilton's experience of only 16 rainy days out of 46, whilst in the ship, out of 77 days, 35 were wet. Snow rarely lies upon the low lands, though we saw very thin ice occasionally between the 15th of March and 1st of June. During this interval the temperature ranged from 40° to 60°, but on one or two occasions as low as 32°, and the wind veered from N.W. to S.W.

The proximity of this extent of fertile land to the Otago Block, with which in fact it is almost connected, suggests the propriety of closing with the natives in their present disposition to sell all that remains to them of the Middle Island. Many parties visited the "Acheron" under the impression and hope that this purchase formed part of our mission, but of course I could only promise that their wishes should be promptly commu-

nicated to your Excellency. Previous to our departure—after marking on the chart the reserves they were desirous of retaining, the Maories, both in Foveaux Strait and at Otago, expressed their desire to sell all the land from Otago to the western coast. 2000*l.* would probably be accepted as purchase-money, one half of which I would suggest should be distributed at Otago, and the remainder at the Bluff, an arrangement securing their fair proportion to all the parties entitled to it.

Stewart Island has an altitude of 3200 feet. Its coast line is strangely distorted in the charts now in use, the south end excepted, which, having been visited by the great navigator Cook, is laid down with his accustomed accuracy. The eastern and northern sides have several good harbours. Of these, Patterson Inlet deserves particular notice, being nowhere surpassed in New Zealand; it has many convenient heaving down coves, and is generally surrounded by fine timber, such as rimu, rata, black pine, totara, &c., &c. This inlet seems very eligible for a small permanent settlement. On a narrow tongue of land forming its eastern shore are congregated twelve out of the 107 European inhabitants of Foveaux Strait, who have likewise a few cattle. The other white men live scattered over the N. and S. shores. Some have passed 22 years in this solitude, and with few exceptions are married to Maori women, and their daughters are the wives of Europeans also. Their small clearings on Stewart Island exhibit a fertile though shallow soil.

Of the Maori population, amounting to 280 individuals, 105 reside on Ruapuki Island, of the whole of which they seem disposed to keep possession, although portions have been purchased by Europeans.

A few plants, common to the Auckland Isles, were also found in Foveaux Strait, and one bird, a snipe, excited our curiosity as being the first of the species seen in New Zealand. Respecting some beaver said to breed in the great lakes, whence the principal south eastern rivers take their rise, no information could be gathered, even from the oldest native, so that their existence is probably a fable. A large lizard, said to exist there, seemed to inspire feelings of apprehension and awe.

Indications of coal\* were observed on only one spot, high up the

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\* "*Monday, May 26th.*—As we proceeded about the time of low water along shore, I was gratified to observe very abundant large pieces of drift coal of good quality; still no bed was visible in the face of the cliff. Further on the beach became again rocky, and quantities of coal were lodged between the rocks, and soon appeared in view a *black cliff*. I felt certain it must be a vast formation of coal, although Mr. —, at Waikauwaikē, had declared that there was no other coal discovered along the coast but the insignificant ap-

Mataura, but of inferior quality. Lignite exists in the New River, where, I before omitted to observe, about 200 head of cattle are depastured showing prime condition from the excellent feed.

The navigation of Foveaux Strait being now rendered secure, and a great obstacle to the settlement of its shores being thus removed, I shall conclude my letter with the hope that a spot so eligible as "Awarua," or the Bluff, will not long remain unoccupied. Many of the peculiar advantages possessed by this site I have already detailed, one more may be adduced, well calculated to bespeak the preference of my countrymen—namely, that it is fully a fortnight nearer to England than any portion of New Zealand now under colonization.

From letters, since received, we learn that "several plans have been forwarded by Captain Stokes, which, in addition to their illustrating the internal routes of the explorers, fix, after the most careful examination, nearly the whole of the coast-line of the E. and S. of the Middle Island, differing materially from the old charts.

"The chart of part of the eastern coast is the result of very careful exploration. The 'Acheron' has four several times examined it, and Mr. Hamilton explored it in a boat, landing every few miles, and making observations. The interior of the southern portion of this part of the Middle Island nearest Bank's Promontory (so called by Captain Stokes) has been explored by that officer in person, and by Mr. Hamilton. The northern portion of the interior has been explored by his Excellency, Lieut.-Governor Eyre, Mr. Hamilton, Captain Mitchell, of the Indian army, and Mr. Dashwood, late of the same service. Captain Mitchell was so much pleased with the country, that he has determined to become a colonist, and is now in the district establishing a sheep-station. He goes to India in a few weeks, whence he will finally return to New Zealand as early as he can make the necessary arrangements for quitting the service. Mr. Dashwood is already a settler at Nelson.

"The other plan exhibits the country about Foveaux Strait, lately explored by Captain Stokes, and through which Mr. Hamilton and Mr. Spencer, one of the officers of the 'Acheron,' walked to Otago. It proves a district of very great value, consisting of level and undulating country, well watered and timbered, and everywhere covered with abundant pasture.

"It contains probably not less than a million acres of agricultural land, besides a large quantity of a mere pastoral character.

"The 'Acheron' is at present in Cook Strait, completing some portion of the survey there; thence I believe she will proceed to New Plymouth, and afterwards to the west coast of the Middle Island, which will be completed

pearance which I had examined at Matakaea. Approaching this cliff, I found it to be a mass of coal for about 100 yards length, in thickness from 12 to 20 feet, as seen in the face of the cliff above the sand, and to what depth it exists beneath the sand I could not ascertain; I should suppose, from appearance of coal, adjacent to the depth of low water. The beach is not accessible on account of the heavy swell and great surf. The coal must, therefore, be worked inland, and the bed will be, no doubt, discovered near the bank of the Mataau River, which, in a direct line inland, is probably not more than 4 or 5 miles distant."—*Extract from Mr. Tuckett's Diary, p. 41.*



during the summer, when the whole of the coast and principal harbours within the Company's territory will have been laid down on the charts. The distinguished character of the officer under whose superintendence this great work is being effected will stamp it with the highest authority, and few operations could have been undertaken of more importance to an insular colony."—ED.

*Memorandum of an Expedition into the Interior of the Middle Island of New Zealand, undertaken by Mr. Dashwood and Capt. Mitchell, for the purpose of finding an Inland Route from the Wairau to the Port Cooper Plains.*

Wellington, June 11, 1850.

"SIR,—Aware of the very great interest felt by the Government, and the public in general, on the subject of an inland route from the Nelson district to the Port Cooper Plains, I have the honour to lay before you, with as little delay as possible, the result of an expedition into the interior of the Middle Island, undertaken by Mr. Dashwood and myself, from which we have just returned.

"A few hurried notes I despatched from the Wairau informed you that Mr. Dashwood and myself had already made a short excursion up the Waiopai, on which occasion, from the top of a hill, whence the Waiopai derives its principal source, we discovered a valley running in a S.S.W. direction. This valley it was now our object to explore.

"Before proceeding I had perhaps better recapitulate the chief observations I made on that occasion, and give the bearings of the principal landmarks, taken from a mountain to which I have heard a very sanguinary appellation given, but which I propose to call Mount Shepherd, and a high range of hills on Mr. Cautley's back run.

"From Mount Shepherd the Kaikoras bore N.E. extreme, E.N.E.; S.W. extreme, W.S.W.—They appeared about 20 miles distant. I could distinctly trace an extensive valley running along their base, concerning which I could not then gain any information. I have since made every inquiry from those well acquainted with the coast, but without success. Its existence appears unknown. There did not seem to be any opening through the Kaikoras.

"On the 11th of April we ascended the Cautley range. The morning was densely foggy, but about 11 o'clock it partially cleared. A gorge running S.E. (it formed one of the boundaries of Mr. Cautley's run) had a promising appearance of leading to an open country. It was, however, intercepted with much bush. Ben Opi bore N. a little E., Mount Shepherd E.N.E., his brother S.E. by S. The range of hills forming the E. boundary of the Wairau, and W. of the Waiopai, ran in a half circle from N. by the W. to S. The mouth of Wairau N.N.E. I could only see the S.W. extreme of the Kaikoras—it bore E.S.E.

"I now commence our second expedition, premising that we took with us a mare and a mule carrying about 2 cwt. each, and were accompanied by Harris, an old whaler.

"After easy travelling along the banks of the Waiopai for 30 miles in a general S.S.W. direction (the first 15 of which appeared a good sheep country), we reached Starvation Hill, from which we had previously seen the valley on the 27th of April. On the 29th we ascended it. A good hill horse is required to carry a load up this hill; it was as much as our animals could do. On reaching the top we unloaded, and proceeding along the range to the W. to a higher peak, we found the three highest summits of the Kaikoras bore due E. To the W. the tops of a dense mass of hills were alone visible. From Starvation Hill due S. stands a peculiar pyramidal hill, which we named

Mount Impey. It is a capital landmark. On my former visit it was remarkable for having snow upon it some distance from the top, while the top itself was quite bare, from which it would appear to be volcanic, and at times in an active state; but now it was covered entirely with snow. Descending into the valley, the travelling became rough; rocks, spear-grass, and the plant called wild Irishman, everywhere abounding. The valley appears never to have been fired; there is no fern or bush in it, but the wild Irishman supplied us with good firewood. Here we experienced a most extraordinarily severe frost; never in England have I felt it so intensely cold. The banks and the rocks in the river were masses of immense icicles, and our clothes were frozen hard and stiff two minutes after we had taken them off.

"We now kept the river, which is joined by a larger stream from the E. The valley had as yet been very narrow, but for 2 miles it now became broader. I will give its course by compass bearings at the end of my letter. The country then again changed, the river, increased by small mountain streams from E. to W., and hemmed in by precipitous rocks, became deep and rapid and difficult, and in many places dangerous to cross. Impossible as it was, however, to walk along its high rugged sides, or make any way through the solid phalanx of spear-grass and wild Irishman, which in these parts grow to a size and strength undreamt of by those whose shins have not come in contact with this most formidable enemy, we were obliged to wade for miles along the edge of a shelf of rocks, from which the mule slipped twice, spoiling all our biscuit. Had it been summer the narrow bottoms might have been burnt, but at best this gorge will always deserve its name of the 'Devil's Grip.'

"After five miles of this amphibious travelling the valley again opened, and Mr. Dashwood and myself having clambered up a hill, discovered, much to our delight, a beautiful valley running N. and S. A river, which had its source in some small hills at our feet, wound through it. The width of the valley I should suppose to be about four or five miles. On each side ran low undulating hills, backed to the E. by a high mountain range, the very picture of a perfect sheep-grazing country. At the distance we were, to judge of the quality of the grass was impossible; though the height of the valley above the level of the sea perhaps rendered this part too cold for good grass, and unfit for sheep. We had the honour to attach your name, Sir, to this valley; and it is my firm belief, that ere long the great S. road will traverse Richmond Valley. Looking down it from the hill on which we stood no impediment whatever could be discerned. Mr. Dashwood believed it to be the Kaiparatahau. I am not sufficiently acquainted with the geography of the N.E. coast to hazard an opinion, but I feel convinced it is the same valley I before mentioned as having distinctly traced from Mount Shepherd running at the base of the Kaikoras. It is separated from Acheron valley (as I propose to call the valley along which we journeyed, after H.M.S. 'Acheron') by easy low hills, over which you might now drive a cart, and thus Starvation Hill, the Devil's Grip, and our enemies, the prickles, would be avoided. If the river does run into the sea at N.E. it may be the Awatere, or the Blind River immediately to the S. of the Awatere. But this is mere supposition. It ought to be immediately explored. Mount Impey bore S.S.E., a little S., the Kaikoras N.N.E.

"*May 3rd.*—Again were we obliged to take to the river, the banks being so densely covered with our well-armed vegetable opponents as to be impassable for man or beast. We attempted to fire, but, alas! in vain; it was too wet. The valley had now gradually increased to the width of two miles, with improving grass which might do for cattle. A large river (the Newcome) ran into Acheron vale from W. The E. bank had been fired.

"*May 4th.*—Harris and myself had to return six miles after the horses,

which had strayed during the night. Mr. Dashwood in the mean time ascended a low range of hills to the W., and discovered a valley which I named after him. He described it as grassy, half a mile wide, and its course S. by W. and N. by E. It ran into Acheron valley E.S.E.

"The river along which we travelled had become a considerable stream, and it behoved us to be careful where we crossed. Cogitating on its bank on the possibility of fording at the point where we then stood, the horse and mule suddenly dashed in, and proved the impracticability by swimming across, and leaving us in the lurch. Some distance further down, we managed with much difficulty to ford it, and regain our steeds. The hills for about seven miles to the W. are low and undulating. A high snowy range then rises and runs parallel with Acheron Vale, from which the rivers and streams appear to derive their source.

"This part of the country would be well worth exploring. Two horses could carry provisions for three months; ample time during long days in fine weather to examine the valleys, and to survey the country E. and W. from the hills, which are all easy of ascent.

"The soil and grasses here were much improved, and good cattle stations might be formed; but I fear the immense quantity of spear-grass, and other prickles, would prove an obstacle for sheep.

"*May 8th.*—The horses recrossed the river during the night, and Mr. Dashwood and Harris returned for them. I climbed a hill, but owing to the fog and clouds could make but little out. A river from N.N.E. ran into Acheron Vale at W. A high snowy range ran N.W. by N. to S.E. by S. The fog precluded my seeing more.

"On the highest peak of the hill I had ascended was a bed of small broken stones, to all appearance of granite, of a very considerable depth. I tried to get at the soil with a stick without success. They gave one the idea of stones put on a recently finished Macadamized road; they were broken to the size of those used in England for private park roads, and were smoothed as if with a shovel. The whole top for some distance down was covered with them.

"Some shrubs—*aniseed*, wild geranium, and parsley; ducks, both black and blue, wikas, cranes, paradise geese, quails, grasshoppers, and flies, seemed to denote improving country, and to hint that we were nearing the coast—at least so we interpreted it. On an expedition of this kind there ought always to be a dog and gun amongst the party. As it was, our dog caught us more wikas than we could eat; but ducks, paradise geese, and quail, would have been dainties we could have daily dined off had we had a gun.

"The first certain signs of Maories we discovered on the 9th; a quantity of firewood collected and the remains of a whari gave certain evidence of an old Maori encampment. The valley at this part was not more than three or four hundred yards wide, in places much less. The hills on both sides were covered with snow. The river turns at right angles to the E., another large one (the Poynter) running into it from the W. On regaining an eminence, I discovered a valley three-quarters of a mile wide. The hills on either side were covered with grass, and in the distance—for the first time since leaving the Waiopi—was bush of black birch and manuka. The valley ran due E. and W. We had now evident signs of the banks of the river having been recently burnt, probably by natives passing along the coast. The soil still continued improving, and travelling easy; but here I have to record an irreparable loss. When midway across the river I found it deeper, and the stream more rapid than I had anticipated; so, to prevent my note-book getting damaged, I held up my blue shirt, and dropped my compass from the pocket, the only one with the party. I have taken correct bearings of the valley for

40 miles, the remainder is guess work. A stream from the N., another from S.W., joined the river.

"Acheron Valley now became impassable, so Mr. Dashwood and myself set out on a surveying expedition. Having arrived at the top of the highest hill, we were rewarded for our labour by a bird's-eye view of a most magnificent country. To the S. we commanded at least one hundred miles in a direct line. The sea between the coast on the plains and Bank's Peninsula had the appearance of a river, and a succession of extensive plains to the S.W. might easily be mistaken for one vast prairie. To the N.E. and E. Mr. Dashwood (who was on a different knoll) saw the sea and the low hills about Cape Campbell.

"I felt now the loss of my compass. Well known landmarks in every direction, and unable to take bearings.

"*May 11th.*—We had up to this period been following the river running through Acheron Valley, which, from subsequent inquiry, I have every reason to believe was the Waipapa, or Big River of the whalers; but now, leaving it running to the N.E., we returned a short distance and took the stream I before mentioned as joining from the S.W. The valley through which it ran we named the Valley of Hope. Keeping along it we mounted a hill from which the stream derives its source. On the S. side of this hill another river takes its rise, and runs in a south-westerly direction. We descended a spur (clothed with black birch bush, through which there is not any difficulty in leading a horse) on the W. side, and came to the bed of the river, which is one of the sources of the Waiau-au. Keeping this for 11 miles, we entered an extensive plain (Hamilton Plain). The grass (very good) was interspersed with fern; and a great deal of manuka grew in patches. A large swamp, in which we nearly left the mare, occupied the centre; various mountain streams ran through it into the Waiau-au. It would prove valuable for cattle stations. Returning towards what we supposed to be the continuation of the same river described above as the source of the Waiau-au, we came, to our surprise, upon an entirely different river, running in a direction exactly opposite to that of the former, which it joins where we met it. At this spot, both turned suddenly to the eastward, at directly right angles to their previous courses, and flowed down to the sea as one broad river the Waiau-au. Some idea may be formed of its size from the fact of our crossing the southerly stream in seven distinct channels. On nearing the shore the last channel became suddenly deep. Taken by surprise, I was carried off my legs, and immersed; but, scrambling up again, I perceived a trusty stick held out to me. Seizing it, I was dragged on shore by the same hand and the same stick that had once before done me the same good service—those of my friend Dashwood.

"Other plains I have no doubt exist to the S.W.; but for three days we could scarcely see the outline of the hills through the fog, although not three miles distant.

"We now wended our way through a sweet pretty valley. The river, which was in one broad stream, surrounded numerous islands covered with wood. On the hills, the flax, fern, and ti-tree was the general herbage; but the spear-grass and wild Irishman still made their appearance in a diminutive form. In some large bottoms of 50 acres close to the bed of the river, which I suppose from their appearance to have been at some period inundated, and in the gullies, between the hills, the soil was particularly rich, producing flax of an extraordinary height and size.

"Issuing from this valley we burst upon the finest grazing plain I have ever seen in this or any other country. I know it is the fate of travellers to be accused of exaggeration, but I care not, as long as I call attention to the splendid inland plains. I will therefore attempt a description from the hasty observations I was enabled to take.



“ The plain, surrounded by low, undulating, grassy hills, backed by higher ranges, is bowl-shaped, and contains not less than 260,000 acres (I believe much more). Two rivers, the Waiau-au and Hurunui, run through it parallel to each other, at eight miles distance. The grass is of the best description, and the soil in many places fit for cultivation. It has a perfect natural drainage, is well sheltered from all winds, has no swamps—but also, I much fear, no wood.

“ I may as well at once say, that through this plain over some easy low hills to the south, is the direct route to Port Cooper. But we, ignorant of the country, with rapidly diminishing provisions, without compass, and in thick weather, deemed it more prudent to make Motunau by the coast, where we knew there was a station.

“ Keeping the Waiau-au for 5 miles further, we entered a gully, but soon finding it impassable, took to the hills, from which we obtained a view of the sea. Descending into another extensive plain with more swamp, but equally good grazing capabilities as the last, we crossed some more hills and reached the coast. These hills by the sea side are covered with fern, flax, ti-tree, toitoi, and manuka.

“ *May 23rd.*—Finding the cliffs perpendicular, and no possibility of gaining the beach, we returned a part of our last day’s walk and taking a southerly direction came to a hill from which we espied a fire on the plain below. Lighting another in answer to it, we remained some time on the look-out for sign of man; but none appearing, we made the coast near a salt lagoon to the north of the Hurunui. About 8 o’clock in the evening we heard a cooing, and shortly had the pleasure of welcoming Mr. Caverhill of Motunau, who had been on the look-out for us for some time, and had followed our track for three days. Piloted by him across the Hurunui (a rapid, deep, and dangerous river), we arrived at his house, where we obtained all we required, food, rest, clothes, and money.

“ From thence leaving Harris, we started for Port Cooper. Losing ourselves on the plains by keeping too close to the sea, a violent snow storm overtook us, and getting entangled in the swamps, over which no horse could venture, we wandered for two days, on the third almost starved from want of food and cold (we had not had a fire since we started, not having any tinder or matches with us), we shouldered our blankets, and leaving our horses made through the swamp to Kaiapoi.

“ In due time we reached the town of Lyttleton, which, with the plains, are too well known to render a description from me necessary, neither is it the purport of this letter to give one; suffice it, therefore, to say, that all I had heard in their favour did not come up, in my opinion, to the reality. I was surprised and delighted at the extent of the land and richness of the soil, the amount of useful work done, and the lasting, solid, yet neat manner in which it has been executed. It does very great credit to all concerned.

“ And now, sir, in conclusion, I have only to add that Mr. Dashwood and myself both regret our inability to furnish more satisfactory information of the country adjacent to that through which we travelled, but the loss of our compass in an utterly unexplored and unknown country, the shortness of the days, the continual thick weather, which prevented our seeing a mile before us for days, and the storms of snow, sleet, hail, and rain, rendered that which may henceforth easily be accomplished in ten days, a difficult and laborious journey of six weeks.

“ I have purposely omitted all adventures merely personal; my aim being, not to write a letter, but an attempt to give a clear, succinct account, useful to future travellers, which, with the kind and able assistance of Mr. Hamilton of the *Acheron*, who knows the greater part of the country over which I tra-

velled after I lost my compass, I hope in a short time to make more comprehensible by a correct map.

" I have the honour to be, Sir,

" Your obedient servant,

(Signed)

" W. MURRAY MITCHELL,

" Capt. 84th Regt.

" His Honour the Superintendent, Nelson.

" The following is the course of Acheron valley—

S. by E. . . . .	5 miles.
W. . . . .	3 "
W. S. W. . . . .	3 "
S. W. by S. . . . .	7 "
S. . . . .	5 "
E.S.E. . . . .	1 1/2 "
S. . . . .	1 "
S.S.E. . . . .	1 1/2 "
S.S.W. . . . .	2 "
S. by W. . . . .	1 1/2 "
S. by E. . . . .	1 1/2 "
S. W. by S. . . . .	2 "
S.S.W. . . . .	1 1/2 "
S. . . . .	1 1/2 "
S. by E. . . . .	1 "
E. a little North . . . . .	3 "

" Here we left the river running N.E., and I lost my compass."

NOTE.—On the reading of the paper by Capt. J. L. Stokes, R.N., 'On the Survey of the Southern Part of the Middle Island of New Zealand, with Memoranda of its Exploration,' Mr. Tuckett made several observations, which the President deemed so important that he requested him to draw up an analysis of them; of which the following is a copy:—  
 " Having been employed in 1844 by the New Zealand Company to explore the eastern and southern coasts of the Middle Island of New Zealand, in order to select a suitable site for the then projected settlement of New Edinburgh, I had occasion to examine carefully the district described. I can fully confirm the accuracy of the observation in respect to the vast extent of available surface which exists south of Tukurau and the Mataura river to the shore of Foveaux Strait, between the Eureka or New River and the Aparima westward, as also to the east of the Eureka. I cannot, however, concur in recommending it as a district eligible for a settlement. Instead of its affording good pasture for grazing or fertile soil for husbandry, in my judgment the surface is rather nude, and the vegetation, chiefly large, detached bunches of a very coarse sharp-edged junk. Where the banks of the Aparima and Eureka are wooded, I found chiefly the totara and the manuka growing luxuriantly, but in deep sand; whilst those portions of the gently undulated uplands which are wooded would afford, almost exclusively, varieties of the birch, which abounds and attains great dimensions even on the poorest land. The earth presents a surface of a whitish hue when dry, without mould or humus, being a deep and gritty clay (as I found by frequently digging), which I am convinced would not bear any adequate crop without being first well manured. Between the east and west branches of the river Eureka the land is low and sandy. Eastward to the coast is a vast bed of fine quartz gravel covered with heather and luxuriant mosses; and in some places occurs peat of pretty good quality and

considerable depth. There is good timber at the western extremity of Bluff Harbour, and between it and the river Eureka some extent of bush land, in and around which a herd of cattle finds sufficient pasture, but feeding chiefly on the milk thistle, &c. There is a small community of Europeans at the Bluff and at the Aparima, who have intermarried with the natives, and who, pursuing whaling, sealing, and husbandry, and in a few instances stock-keeping, have attained to very comfortable circumstances. Some were in the practice of growing wheat, but they informed me that the climate was unfavourable, rains being frequent and copious, and the gales of wind boisterous. While my vessel lay at anchor in the Eureka, in the month of May, we had to encounter, in the surveys executed and our several exploratory journeys, very inclement weather. Considering then the climate, the soil, and the natural growth, I am convinced that there is no very eligible site for a future settlement south of the Maitara river and Tutarau; a favourite residence of the natives formerly, when they were more numerous, because it afforded shelter from the southern climate, good fishing and fertile land. From Tutarau north to Otago there is an unbroken tract of fertile and well-watered land, affording abundant pasture and much of it of excellent quality for tillage. It abounds with supplies of coal, wood, timber, brick-earth, stone, conveniently dispersed through the district, and very accessible by the facilities of inland navigation which its rivers and lakes afford. Again:—For fifty miles north of Otago there is a district presenting almost equal capabilities for large productiveness. Further north, along the ninety miles beach, extending about twenty-eight miles above Banks Peninsula, there is a vast plain, for the most part either too arid and stony or too wet and swampy to be eligible for occupation. There is but a very limited quantity of fertile land good enough for tillage within a distance of twenty miles of either of the harbours of Banks Peninsula. The surfaces of plains in New Zealand usually present a succession of terraces in lines parallel with the courses of the rivers, rising in steps of from 6 ft. to 14 ft. in elevation. Much of the surface is desolated by a closely-imbedded boulder and shingle: and usually where these occur of the greatest breadth, and where is a dead level, the surface is the most stony. On the hill lands of Banks Peninsula there is good pasture; but it is not so on the plain. My reasons for rejecting it as ineligible for the site of a settlement, as well as my Report of the entire journey of exploration which I made in 1844, are alluded to in the Seventeenth Report of the Directors of the New Zealand Company, and the substance of the same will be presented to the public under the head of 'Topography of the Middle Island of New Zealand' in the work on British Colonies written by Mr. R. M. Martin."—Ed.

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V.—*Remarks on the use of the Aneroid Barometer.*—By Colonel PHILIP YORKE, F.R.S., F.R.G.S.

[Read Feb. 10, 1851.]

THE portability and facility of observing the aneroid barometer has of late occasionally induced travellers to substitute it for the mercurial barometer in meteorological observations, and for obtaining differences of level. But before the value of such observations can be estimated, it seems necessary that comparative observations of the aneroid with the ordinary barometer should be made under different circumstances.

As I had not heard that such a series of observations had been made, I employed some time during the past summer in an attempt to supply the desideratum. For this purpose I provided myself with a portable barometer (of Fortin's construction), made by Barrow, and an aneroid obtained from Messrs. Watkins and Hill, which was furnished with a thermometer and with a vernier reading to 1-500th of an inch.

The observations were carried on during 115 days, partly in London and in Herefordshire, and partly during a tour in France; these are recorded in the following tables. The barometer is reduced to 32° Fahr., and corrected for capillary action. The 7th column shows the difference observed between the two instruments, that obtained by the first comparison being reckoned as = 0. It should be observed that the portable barometer was also compared with a fixed standard instrument in Eaton-place, before going to, and after returning from Herefordshire, as recorded in table II. And as the portable barometer was broken in the tour abroad, the aneroid was compared on return with the standard barometer, corrected to the level of the portable (see Table III.), by means of the previous comparison.

On examining the observations, it will be seen that when the instrument is at rest the difference between it and the barometer gradually increases, though in an irregular manner. Thus, at Perristone, the station in Herefordshire, on July 9th, the difference, reckoning from the assumed zero, is + .018, while on August 6 it has risen to about + .080. This particular instrument when remaining in the same place always increased its error in the same direction, viz. by indicating too high a pressure. The motion occasioned by travelling appears to produce a difference sometimes in one direction and sometimes in the other. The greatest variation (probably arising from the motion) in a short time is shown by the observation at Clermont, August 19, diff. = + .041, and at Mont d'Or les Bains, August 20, diff. = - .025, the variation = 066 in. The extreme amount of variation shown during the whole time is from the lowest point at Mont d'Or, on August 22 (diff. = - .108), to the highest at Eaton-place, October 20 (diff. = + .143\*) = .251.

If we examine the observations made on the Puy de Pariou, and at Clermont, before and after the ascent, for the purpose of comparing the capability of the aneroid with that of the mercurial barometer, for determining by such means differences of level, we find the mean of the two observations at Clermont with

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\* This difference is now, January 27, 1851, = .202, making the total variation from the assumed zero in 7 months = .31 in.

the barometer giving the pressure = 28·778 in., and on the Puy = 26·145, diff. = 2·630 in.

With the aneroid the corresponding observations at Clermont give 28·906 in. ; on the Puy, 26·286 in. ; diff. 2·62. The difference between the results of the two instruments is only = ·01 in., about 9 feet in level.

Similar observations at Clermont and on the summit of the Puy de Dome give for the difference, with the barometer, 3·440 in., and with the aneroid 3·466. The difference of result between the two instruments is therefore ·026 in. = about 24 feet. In the observations of like nature which were made on the Pic de Sancy, the barometrical observation is defective, owing to the cistern containing so much mercury that the level of the mercury therein could not descend quite to that of the ivory point ; so that the column of mercury actually stood somewhat lower than what is registered. Yet the aneroid shows a pressure = ·064 in. higher than that which the barometer indicates on the summit, and the difference of result between the two instruments (obtained as in the previous observations) is = ·12 in. This observation, then, seems to show that we have now arrived at a point in the scale of the aneroid (24 in.) where the indications begin to err from defect in the elasticity of the metallic vessel, on which the atmospheric pressure originates motion in the instrument. On the Pic du Midi the error of the same kind is certainly more than 8-10 in. But here the height demands that a lower pressure should be indicated than is pretended to be reached by the graduation of the instrument.

These observations lead me then to conclude—1st, that the aneroid may be used satisfactorily when sudden changes of atmospheric pressure is what is required to be shown ; 2nd, that it may occasionally be usefully employed to determine differences of level to within a probable error equal to ·03 in. or ·04 in. of mercury, when it can be compared before and after the observations, and within about 24 hours, with a good ordinary fixed barometer reading to 1-100th of an inch. When the aneroid is to be used for such purposes it should be carefully compared previously with the barometer at low pressures under an air-pump. It must always be observed in the same position. I find that mine stands ·033 in. lower when suspended vertically than when in a horizontal position. It should be furnished with a vernier to read to 1-100th of an inch ; but it is useless to carry the division further. Finally, that it cannot be depended on for any length of time, as an independent instrument, for observations intended to show the atmospheric pressure.

TABLE I.

Journal of Comparative Observations made with the Aneroid and Mercurial Barometer in the Summer of 1850.

Date.	Temperature of Air.	Thermometer to Aneroid.	Aneroid Barometer.	Barometer.	Dif. 1.	Dif. 2.
Eaton Place. Lat. 51° 30' N.; Long. —						
h. m.						
June 30, 11 15 A.M.	..	65	30·242	29·965	0·277	0·000
„ 30, 3 15 P.M.	..	66	30·244	29·967	0·277	0·000
July 1, 9 0 A.M.	..	65	30·180	29·888	0·292	+·015
„ 1, 5 0 P.M.	..	65	30·174	29·886	0·288	+·001
„ 2, 12 0 „	..	66	30·192	29·890	0·292	+·015
„ 2, 1 40 „	..	40	30·176	29·887	0·289	+·012*
„ 2, 2 30 „	..	36·5	30·180	29·894	·286	+·009
„ 2, 3 20 „	..	36	30·180	29·895	·285	+·008
„ 3, 11 0 A.M.	..	65	30·054	29·743	·311	+·034
„ 3, 12 0 „	..	65	30·058	29·764	·294	+·017
„ 3, 1 20 P.M.	..	90	30·024	29·769	·255	—·022†
„ 3, 6 0 P.M.	..	68	30·170	29·884	·286	+·009
„ 4, 1 30 P.M.	..	65	29·860	29·754	·106	·000‡
„ 4, 9 0 „	..	64	30·012	29·913	·099	—·007
„ 5, 9 0 A.M.	..	62	30·180	30·088	·092	—·014
	..	68	30·194	30·101	·093	—·013
Perristone. Lat. 51° 55' N.; Long. —						
July 9, 11 50 A.M.	..	63	29·658	29·534	·124	+·018
„ 9, 2 20 P.M.	..	63	29·635	29·518	·117	+·011
Top of Perristone Hill:—						
July 9, 3 20 P.M.	..	60	29·480	29·358	·122	+·016
Perristone House:—						
July 9, 4 10 „	..	64	29·628	29·518	·110	+·004
„ 10, 9 0 A.M.	..	62	29·706	29·588	·118	+·012
„ 10, 12 0 „	..	63	29·694	29·573	·121	+·015
„ 11, 9 0 „	..	66	29·696	29·576	·120	+·014
„ 11, 3 0 P.M.	..	67	29·706	29·586	·120	+·014
„ 11, 11 30 „	..	68	29·726	29·609	·117	+·011
„ 12, 9 0 A.M.	..	67·5	29·728	29·607	·121	+·015
„ 12, 3 0 P.M.	..	70	29·670	29·552	·118	+·012
„ 13, 9 0 A.M.	..	69	29·666	29·546	·120	+·014
„ 13, 2 30 P.M.	71	71	29·640	29·525	·115	+·009
„ 14, 9 0 A.M.	60	67·5	29·702	29·589	·113	+·007
„ 15, 9 0 „	69	68·5	29·608	29·491	·117	+·011
„ 15, 3 0 P.M.	..	72	29·536	20·416	·120	+·014
„ 16, 3 0 A.M.	..	74	29·534	29·411	·123	+·017
„ 17, 9 0 „	..	71	29·534	29·405	·122	+·023
„ 17, 3 0 P.M.	75	74	29·508	29·377	·121	+·015

\* Aneroid put into a cooling vessel.

† Aneroid put into a heating vessel.

‡ Aneroid re-adjusted.

TABLE I.—continued.

Date.	Temperature of Air.	Thermometer to Aneroid.	Aneroid Barometer.	Barometer.	Diff. 1.	Diff. 2.	
Perristone House :—							
	h. m.						
July 18,	9 0 A.M.	68	71·5	29·596	29·469	·127	+·021
„ 18,	3 0 P.M.	..	72·5	29·572	29·437	·185	+·029
	(Thunder-storm.)						
„ 19,	9 0 A.M.	68	70	29·608	29·475	·133	+·027
„ 19,	3 0 P.M.	..	72	29·592	29·439	·153	+·047
„ 20,	9 0 A.M.	63	68	29·612	29·468	·142	+·036
„ 20,	3 0 P.M.	67·5	70·5	29·576	29·435	·141	+·035
„ 21,	9 0 A.M.	66	69	29·576	29·436	·140	+·034
„ 21,	2 0 P.M.	..	72	29·554	29·412	·142	+·036
„ 21,	11 0 P.M.	..	69	29·572	29·425	·147	+·041
„ 22,	9 0 A.M.	70	68	29·552	29·412	·140	+·034
„ 22,	3 0 P.M.	..	70	29·522	29·379	·143	+·037
„ 22,	9 0 A.M.	72	71·5	29·434	29·289	·145	+·039
„ 23,	12 0 „	78	74	29·398	29·251	·147	+·041
„ 23,	3 0 P.M.	67	72	29·426	29·281	·145	+·039
„ 24,	9 0 A.M.	61·5	66	29·572	29·417	·155	+·049
„ 24,	3 0 P.M.	64	72	29·540	29·394	·146	+·040
„ 25,	9 0 A.M.	55	65	29·334	29·182	·152	+·046
„ 25,	12 0 „	60	64	29·246	29·088	·158	+·052
„ 25,	3 0 P.M.	..	64	29·258	29·096	·162	+·056
„ 26,	9 0 A.M.	62	63	29·346	29·196	·150	+·044
„ 26,	12 0 „	64	63·5	29·362	29·214	·148	+·042
„ 26,	3 0 P.M.	65	64	29·380	29·230	·150	+·044
„ 26,	3 47 „	66·5	70	29·790	29·653	·137	+·031*
„ 26,	5 15 „	62	70	29·392	29·236	·156	+·050†
„ 27,	9 0 A.M.	58·5	68	29·442	29·286	·136	+·050
„ 27,	11 0 P.M.	..	64	29·588	29·430	·158	+·052
„ 28,	9 0 A.M.	62	62·5	29·672	29·514	·158	+·052
„ 28,	11 0 P.M.	..	65	29·756	29·596	·160	+·054
„ 29,	9 0 A.M.	61	64	29·792	29·628	·164	+·058
„ 29,	3 30 P.M.	63	64	29·796	29·639	·157	+·051
„ 30,	9 0 A.M.	64	65	29·882	29·726	·156	+·050
„ 30,	3 0 P.M.	70	65	29·850	29·689	·161	+·055
„ 31,	9 0 A.M.	63	68	29·804	29·637	·167	+·061
August 1,	9 0 „	62	68·5	29·862	29·701	·161	+·055
„ 2,	9 0 „	66	68	29·754	29·585	·169	+·063
„ 2,	3 0 P.M.	71	70	29·722	29·547	·175	+·069
„ 3,	9 0 A.M.	68	68·5	29·729	29·555	·173	+·067
„ 3,	3 0 P.M.	72	72·5	29·684	29·513	·171	+·066
„ 4,	9 0 A.M.	65	68	29·546	29·365	·181	+·075
„ 4,	6 0 P.M.	..	67·5	29·470	29·283	·187	+·081
„ 5,	9 0 A.M.	62	66	29·390	29·202	·188	+·082
„ 5,	3 0 P.M.	65	68	29·332	29·150	·182	+·076
„ 6,	9 0 A.M.	62	63	29·430	29·248	·182	+·076
Eaton Place :—							
August 6,	9 0 P.M.	64	70	29·908	29·732	·176	+·070
„ 7,	12 0 A.M.	..	70	30·074	29·901	·173	+·067

\* By the river Wye.

† At the house.

TABLE I.—continued.

Date.	Temperature of Air.	Thermometer to Aneroid.	Aneroid Barometer.	Barometer.	Diff. 1.	Diff. 2.
Eaton Place:—						
Aug. 8, 9 0 A.M.	..	69	29.928	29.741	.187	+ .081
„ 9, 9 0 „	..	66	29.900	29.718	.182	+ .076
Paris. Lat. 48° 50'; Long. 2° 20' E.:—						
Aug. 11, 11 0 P.M.	..	73	29.896	29.697	.199	+ .093
„ 12, 9 0 A.M.	66	69	29.874	29.657	.217	+ .111
„ 12, 4 0 P.M.	..	70	29.810	29.616	.194	+ .088
„ 13, 9 0 A.M.	64	69	29.900	29.704	.196	+ .090
Clermont, Hôtel de l'Écu. Lat. 45° 47' N.; Long. 3° 5' E.						
Aug. 16, 9 0 A.M.	..	69	28.844	28.697	.147	+ .041
„ 17, 9 0 „	70	69	28.954	28.806	.148	+ .042
„ 18, 9 0 „	71	72	28.964	28.814	.150	+ .044
„ 18, 1 15 P.M.	72	72	28.926	28.776	.150	+ .044
Summit of Le Puy de Pariou:—						
Aug. 18, 4 40 P.M.	58	64	26.286	26.145	.141	+ .035
Clermont, on return:—						
Aug. 18, 6 45 P.M.	71.	70	28.886	28.775	.111	+ .005
Aug. 19, 9 0 A.M.	75	72	28.854	28.734	.120	+ .014
Summit of the Puy de Dome:—						
Aug. 19, 1 30 P.M.	59	69	25.368	25.260	.108	+ .002
Clermont:—						
Aug. 19, 5 20 P.M.	73	73	28.814	28.667	.147	+ .01
Mont d'Or les Bains:—						
Aug. 20, 10 0 P.M.	..	60	26.556	26.475	.081	— .025
„ 21, 9 0 A.M.	64	64	26.402	26.325	.077	— .029
Summit of Pic du Sancy:—						
Aug. 21, 1 30 P.M.	53.5	62	24.024	23.854*	.170	+ .064
Mont d'Or les Bains:—						
Aug. 21, 4 30 P.M.	63	64	26.348	26.324	.024	— .082
„ 21, 9 30 „	..	..	26.444	26.406	.038	— .068
„ 22, 9 0 A.M.	60	63	26.450	26.452	— .002	— .108
„ 22, 12 0 „	..	64	26.454	26.450	+ .004	— .102
„ 22, 9 0 P.M.	..	65	26.410	26.384	.026	— .080
Clermont:—						
Aug. 24, 9 0 A.M.	58.5	66	28.770	28.715	.055	— .051

\* Observation defective owing to Mercury in the cistern not descending to the level of the ivory point.



TABLE I.—continued.

Date.	Temperature of Air.	Thermometer to Aneroid.	Aneroid Barometer.	Barometer.	Diff. 1.	Diff. 2.	
<b>Le Puy. Lat. 45° 3' N.; Long. 3° 53' E.:</b>							
Aug. 25, 12	0 A.M.	64	65	28·122?	28·195	—·073	—·179
„ 25, 9	0 P.M.	..	67	28·188	28·156	+·032	—·074
„ 26, 9	0 A.M.	63	64	28·186	28·150	·036	—·070
„ 27, 9	0 „	65	66	28·192	28·161	·031	—·075
<b>Aubenas:—</b>							
Aug. 28, 10	0 A.M.	71·5	71	29·136	29·090	·046	—·064
„ 29, 9	0 „	70	70	29·016	28·900	·102	—·050
„ 29, 3	0 P.M.	76	73	29·010	28·908	·102	—·004
<b>Nimes. Lat. 43° 50' N.; Long. 4° 21' E.:</b>							
Aug. 31, 9	0 A.M.	67	73	30·022	29·940	·082	—·024
Sept. 2, 9	0 „	69	71	30·268	30·183	·085	—·021
„ 3, 9	0 „	69	72	30·246	30·148	·098	—·008
„ 6, 9	0 „	69	72	30·102	39·938	·164	+·058
<b>Montpellier. Lat. 43° 36' N.; Long. 3° 52' E.:</b>							
Sept. 7, 9	0 A.M.	66	69	30·170	30·004	·166	+·060
„ 7, 3	50 P.M.	73	71	30·104	29·944	·160	+·054
<b>Toulouse. Lat. 43° 30' N.; Long. 1° 26' E.:</b>							
Sept. 9, 12	30 P.M.	64	65	29·764	29·629	·135	+·029
<b>Bagnères de Bigorre. Lat. 43° 4' N.; Long. 0° 9' E.:</b>							
Sept. 11, 9	0 P.M.	..	72	28·190	28·112	·078	—·028
„ 12, 9	0 A.M.	71	70	28·160	28·066	·094	—·012
„ 12, 12	0 „	64·5	69	28·184	28·086	·074	—·032
„ 13, 9	0 „	64	67	28·218	28·120	·088	—·018
„ 13, 2	0 P.M.	66	69	28·196	28·118	·078	—·028
„ 14, 9	0 A.M.	62	65	28·142	28·031	·111	+·005
„ 14, 3	0 P.M.	66	67	28·120	28·017	·103	—·003
„ 15, 9	0 A.M.	63	65	28·088	27·981	·107	+·001
„ 15, 3	0 P.M.	63	66	28·106	27·992	·108	+·002
„ 16, 9	0 A.M.	57·5	64	28·152	28·053	·099	—·007
„ 17, 9	0 „	62	63	28·236	28·130	·106	·000
„ 18, 9	0 „	57	..	28·236	28·130	·106	·000
„ 18, 3	30 P.M.	59	65	28·194	28·089	·105	—·001
<b>Grip:—</b>							
Sept. 18, 6	45 P.M.	54	62	26·706	26·576	·130	+·024
„ 19, 7	30 A.M.	52	57	26·620	26·486	·134	+·028
<b>Summit of Pic du Midi:—</b>							
Sept. 19, 12	0 A.M.	47	45	22·050	21·1*	·950	+·844

\* Barometer broken before final reading.

TABLE II.

Comparison between Standard Barometer (Newman's) and Portable Barometer (Barrow's), both reduced to 32° Fahr. and corrected for Capillary Action.

Date.	Standard Barometer.	Portable Barometer.	Difference.
Eaton Place:—			
July 1 . . . . .	29·797	29·808	+·011
„ 2 . . . . .	29·804	29·815	+·011
„ 2 . . . . .	29·866	29·880	·014
Aug. 6 . . . . .	29·722	29·730	·008
„ 7 . . . . .	28·821	29·833	·012
	..	..	+·011

TABLE III.

Comparison between Aneroid Barometer and Newman's Standard, reduced to 32° Fahr. and to Portable Barometer.

Date.	Standard Barometer.	Aneroid Barometer.	Diff. 1.	Diff. 2.
Eaton Place:—				
Oct. 20, h. m.	29·871	30·120	·249	·143
„ 21, 1 0 P.M.	29·957	30·186	·229	·123
„ 21, 10 0 „	30·086	30·306	·220	·114
„ 22, 10 0 „	29·842	30·062	·226	·120
„ 23, 3 0 „	29·161	29·408	·247	·141

VI.— *On the Adaptation of the Aneroid for the purposes of Surveying in India.* By GEORGE BUIST, LL.D., F.R.S., Corresponding Member of the Royal Geographical Society of London. Communicated by Col. SYKES, F.R.S., F.R.G.S.

[Read February 24, 1851.]

ONE of the great desiderata with travellers is to be able to obtain an instrument for measuring elevations of moderate size, consider-

able portability, and immunity from injuries from the accidents apt to be encountered in journeying through new countries. Great degrees of nicety or exactitude are rarely attainable on a first visit, and are willingly dispensed with, in comparison to tolerable approximation, when only attainable by great risk, trouble, and delay. The mountain barometer can be made tolerably portable so far as size and weight are concerned; but in its strongest and most efficient form it is so extremely liable to accidents, so expensive and so difficult in India to have it repaired or replaced, that few travellers care to be encumbered with it at all. The mountain thermometer has done excellent barometric service in India, but it has seldom happened that instruments cut finer than fifths of a degree have been made use of; at moderate elevations one degree corresponds to 500 feet; so that even when degrees are cut to tenths, the smallest division will not indicate less than 50 feet. A good barometer, reading to hundredths, will indicate 10 feet. The mountain sympiesometer scarcely seems to have been made use of at all amongst us—wherefore, I know not: the instrument is quite as portable as the aneroid, and much less susceptible of injury than the mountain thermometer; it reads with almost the delicacy of a barometer, but is apt, on being long used in the country, to change its rate. Both the aneroid and sympiesometer in their best forms require to be frequently referred to a standard barometer. The mountain thermometer has this additional advantage over both—that, once rated, it runs little risk of going sensibly wrong: I say sensibly; for, by a late paper of Mr. Adie's, it appears that even thermometers alter very materially in their indications.\* The mountain thermometer, portable as it is, is far from exempt from accidents, and, besides being liable to be broken, is easily injured by means of careless handling, and broken while being boiled; the air is apt to get entangled with the mercury,—an accident often occurring to such an extent as to occasion the risk or destruction of the instrument.† Under all

\* Mr. John Adie, of Edinburgh, has published a very interesting article in the 'Philosophical Journal' for July, 1850, on the change which takes place in the standard points of thermometers (pp. 122-125). This appears sometimes to amount to no less than nine-tenths of a degree in a few months: this is equal to 450 feet in measurement, supposing we have scales cut to tenths, and no means of detecting or indicating the error. I do not think any aneroid or sympiesometer likely to go wrong to the extent of half an inch—nearly the equivalent of this, if they have been tolerably taken care of, and compared within a twelvemonth or so with a standard barometer; or, which is the same thing, rated from a point of known elevation—so that the general statement in the text must be taken with allowances after all that has been said in favour of mountain thermometers.

† The following description is given by Mr. Adie of the thermometers supplied by him to the Bombay Geographical Society; they are the most beautiful instruments I have ever seen:—

“The thermometers for the determination of altitudes by the boiling point of

these circumstances, were the improvements of which the aneroid is obviously susceptible applied to it, it is likely that, all in all, it is

water are constructed as follows: A piece of tube is selected of perfectly equal calibre throughout its length; the section of the bore is round and fine, for the purpose of giving long degrees without having a very large bulb, which renders the carriage of such thermometers very dangerous for breakage. The bulb is made of glass cylinder-tube, which can be made more equal and stronger than a round blown bulb; and the proper size having been determined for each tube, the scales are determined by the following process: each tube with its finished bulb is weighed by a fine balance to 1-100th of a grain; they are then fitted with pure dry mercury, and regulated so that 62° shall have the same position as 212° is to have when the thermometer is finished.

"Temporary scales, divided into inch and decimal parts, are then fixed to each tube, and the point 32° obtained from melting ice, and 62° from a fine standard thermometer, and carefully read off on these temporary scales. This gives the length of 30° at these temperatures. But it is evident that this length would be greater than 30°, if we drive out a portion of the mercury to make 212° stand at the point where 62° stood when the scales were measured. This is corrected by carefully weighing the tubes before and after regulating them for 212°, and the proportion is stated. If the larger quantity of mercury give the length noted, the diminished quantity of mercury from regulation to 212° will give a diminished scale, which scale is the true or corrected one, to be divided on the thermometer; each degree is subdivided into fifth or tenth parts, and cut on the glass stem of the thermometer, or may be laid down on an attached scale.

"When the thermometer is to be used the bulb must be carefully inspected, to see that there are no small detached globules of air attached to the interior of the bulb. Should such be found, they are to be removed by shaking in a larger globule from the contracted part of the bulb, and making it pass over the smaller globules, which it will take with it; it is then to be returned to the contracted part; and should any small portion of the mercury lodge in the tube it is to be joined to the column by heating the bulb till it rise to the small tube at the top of the thermometer, where the detached portions will unite.

"The best method of using these thermometers is to have the bulb and column of mercury up to the reading point brought to the boiling temperature: this is best done by a boiler provided with telescope slide-tubes, which can be regulated to any required length; or where such an apparatus is not at hand, the same length of column, as nearly as possible, should be kept out of the water. Professor J. D. Forbes ('Philosophical Transactions, Edinburgh,' vol. xv. p. 409) has, with great care, determined the difference of altitude due to a change of 1° in the boiling point of water, and found it to be 545.9 ft. for each degree of Fahrenheit. Thermometers used for this purpose should be frequently compared one with another, and their differences noted; or, where one only is used, the instrument should be noted as frequently as possible, both for the purpose of obtaining more perfect results from a mean of the observations, and for correcting small changes in the indication which go on in course of time.

"For security in carriage the thermometer is enclosed in a brass case, and supported at all points by woollen stuffing, and is removed from its case by screwing off the top and bottom, and pushing out the bulb, when the thermometer may be drawn out."—(For Tables and Directions see Appendix.)

Mr. Adie gives no directions for putting his mountain thermometer to rights when out of order. Having had some experience in this, I may mention the following as the result:—The air left purposely in the instrument is always apt to get interspersed betwixt portions of the mercury. When the detached portion is not very far up the tube—higher, say, than 200—then it may be brought back into the bulb by evaporation—a saline solution, ether, or ice. Should a considerable quantity of the quicksilver have got into the upper bulb, the first thing is to strike it by tapping to one side, to allow the air from below to pass it without obstruction; then boil the thermometer in a basin of strong brine; when at its highest, tap the upper bulb, and the mercury will fall back into the tube, and probably be driven

one of the most convenient instruments the traveller can make use of within the limits to which it is trustworthy, whatever these may be. Mr. Adie considers them trustworthy to 28 inches only, or about 2000 feet in altitude, and did it suit within this it would be much; but it still remains to be seen whether it may not prove suitable to two or three times this elevation.

It appears to me that at home the value of the instrument has been greatly underrated, and it has been looked on, notwithstanding all the noise that has been made about it, as little better than a fair-weather glass, fit enough to take the place of the wheel-barometer, but fit for nothing more. Nothing, certainly, can be more ridiculous than the legends "set fair," "fair," "change," "rain," "much rain," and "stormy," with which instruments are encumbered, if they be meant for survey purposes. In the Deccan, or wherever throughout the fine weather the aneroid indicates a state of perpetual tempest—and the same is the case with all other localities of an elevation of 2000 feet—the legends are worse than perplexing and useless; they occupy space which might be valuably employed otherwise. The brass index, or register, may be expedient at home, where the instrument is used as a weather-glass only, and people are too slovenly or careless to write down their observations. Here it is an encumbrance, continually in the way, and liable to bring about the breaking of the glass. It ought to be at once discarded. The aneroid, as used at home, is cut from 27·5 to 31 inches, though it indicates 2500 feet: it ought to be cut all round the scale, or down to 23 inches at least. This will suit for Simla, or the summit of the Nilgherries.

The following description of the aneroid, taken from Dr. Purdie Thomson, will make what is about to be stated more clear than it otherwise might be to the general reader:—

"*The Aneroid Barometer.*—Since writing the preceding paragraph, the author has inspected \* this new and beautiful instrument, invented by M. Vidi. It was described by Professor Lloyd to the British Association,† and reported to have stood the test of being placed under the receiver of an air-pump, when the indications corresponded with those of the mercurial gauge to less than 0·01 inch. The principle upon which the instrument depends is the pressure of

down by the air now above it. Allow the instrument to cool leisurely, and then cool the lower bulb as much as possible by any of the means already mentioned, when probably all will come right as before. Failing a bath of brine, use oil; but take great care in this case that the heat be not carried too far, so as to burst the tube. It is very probable that by expansion all the air may be made to pass above the mercury in the upper bulb, and the column become united without artificial cooling. On no account resort to a fire, charcoal, or a lamp, as you are almost sure to crack the bulb:—*experto crede.*

\* At Mr. Abraham's, Lord Street, Liverpool. The price is 3*l.* It is 4½ inches in diameter, and 1½ inches thick. The scale is divided to 0·025 inch.

† At Swansea, in 1848.

the atmosphere upon a metallic chamber partially exhausted, and so constructed, that by a system of levers a motion is given to an index-hand which moves upon a dial.

“The principle of the vacuum-case was formerly applied by M. Conte\* in Egypt, but from the faulty mode of constructing his instrument, it was rejected and neglected.

“Upon comparison of indications made with the aneroid barometer—not corrected for the particular temperature—and a very perfect mercurial barometer, given by Mr. Dent, we find that from forty-nine observations made between the 6th January and 23rd February, 1848, the mean difference was 0·037 inch, the *aneroid* being in excess; and from sixty similar observations made with a standard barometer, during December, 1848, and between the 3rd and 31st January, 1849, the mean difference amounted to 0·026 inch, the *mercurial* being, in this case, in excess over the aneroid barometer. Combining these observations (109 in number) a mean difference amounting to 0·0025 inch is found to exist, the indications of the aneroid being in excess.† For general use the instrument is thus shown to be well suited; for the measurement of heights it is peculiarly adapted, from its portability and comparative strength; and for nautical purposes we know of no better instrument.

“Fig. 1 represents the external appearance of the aneroid barometer; Fig. 2, its internal arrangement, where the dial is supposed to be removed and the index hand retained; and Fig. 3, a perspective view of the same.‡

Fig. 1.

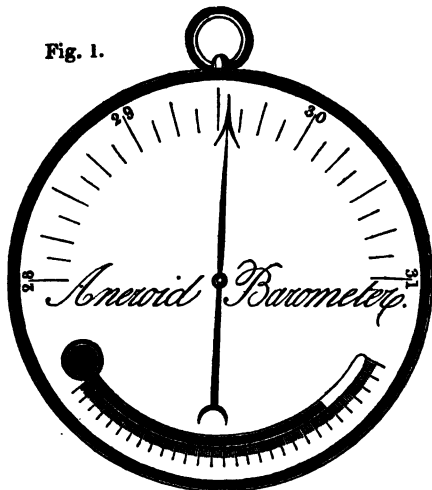
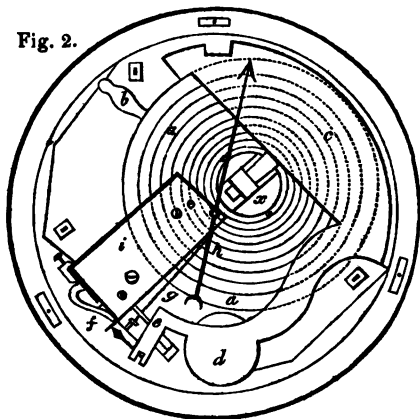


Fig. 2.



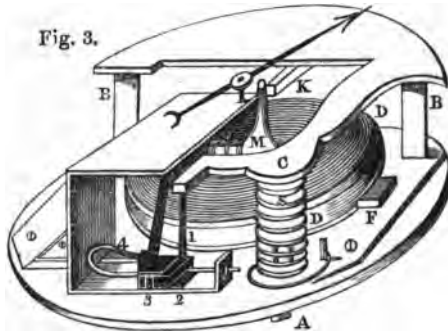
\* Bulletin des Sciences. Floreal, An 6, p. 106.

† The sum of all these observations gave 2139·722 inches for the aneroid, and 3239·44 inches for the mercurial barometer, the difference being 0·272 inch, which, divided by 109, = 0·00249.

‡ We beg to acknowledge the kindness of Mr. Dent in permitting casts to be taken of Figs. 3, 4, and 5, Aneroid Barometer.

“ In Fig. 2, *a* is the metallic chamber or vacuum-vase, which receives the atmospheric impressions; it is corrugated in concentric circles, which increases its elasticity, and renders it more susceptible of atmospheric impressions; *b* is the tube, hermetically sealed, through which the air in *a* is exhausted. At the centre of *a* there is a solid cylindrical projection *x*, to the top of which the chief lever *c d e* is attached—this lever, which is of the second order, rests upon fixed pins, *r* fulcra, placed vertically, and upon a spiral spring under *d*, but it is perfectly mobile. The extremity *e* of this lever is attached by a vertical rod and bow-shaped spring *f*, with another lever to which a watch-chain *g* is fastened, and extended to *h*, where it works upon a drum fixed to the axis of the index-hand, connected with a delicate spring at *h*,—the vertical motion is thus changed to a horizontal one, and the hand, which is attached to the metallic plate *i*, is thereby moved upon the dial. The movement originating in the vacuum-chamber is multiplied by these levers, so that a change in the corrugated surfaces, amounting to 1-220th of an inch, carries the point of the index-hand through a space of 3 inches on the dial.

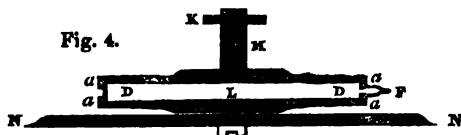
“ In Fig. 3 the vacuum-chamber is represented by *D*; the large lever by *C*, resting upon the fulcra *B B* and spiral spring *S*, and supporting the box *D* by the pin *K*. At the extremity of *C* is seen the vertical rod (1) connecting it with the levers (2 and 3) by the bow-



shaped spring (4). The square-headed screws *b e*, by screwing or unscrewing, admit an alteration in the distance of leverage, and thereby enable the index-hand to move over a space corresponding with the scale of a mercurial barometer. To the lever (3) is attached a light rod, terminating with the watch-chain, which is attached to the drum fastened to the axis. The handle is kept firmly fixed when not in motion, by a delicate flat spiral spring attached to the axis, acting against the force of the levers, and always in a state of tension. *F* is the exhausting tube: and *A*, at the back of the instrument, is a screw, which, upon being turned, alters the position of the index-hand, and thus enables the observer to adjust the aneroid to any mercurial barometer. The atmospheric pressure increasing on *D* will cause a slight depression of the corrugated surface to which *K* is attached, and a

corresponding inclination of the lever C; but as this lever is resting upon unmovable fulcra at B B, the motion will take place chiefly over the spiral spring S, the increased distance of the lever being as six to one. The metallic chamber being 2.5 inches in diameter, the pressure of the atmosphere should be about 73 lbs. upon the corrugated diaphragms, but owing to various causes it is not more than 44 lbs.

“ Figs. 4 and 5 represent the vacuum-case, separated from the levers. The former shows the case before exhaustion; the latter after the air has been withdrawn. *a a a a* indicate the lapping over of the thin



corrugated metallic diaphragms, where they are soldered to the rim; D is the vacuum-chamber, with F the exhausting tube; and L the screw part fixing D to the metallic plate N below. In Fig. 5 the vacuum-case is in a state of compression after being exhausted, and M represents the socket, which, being pulled by the pin K, places D in a state of tension. The dotted line marks the position of the diaphragms after the introduction of the gas, which effects compensation for changes in the capacity of the case by alterations of temperature. Without this gas the capacity of the case would be diminished by heat and increased by cold, but the changes in the elasticity of the gaseous fluid by varying temperatures effect compensation. In using the aneroid barometer for scientific purposes, a certain thermometrical correction is required. This is made by carefully noticing the indication of the instrument in the external atmosphere, then placing it before a fire till the thermometer indicates 100° F., and watching the change which has taken place. The variation of the hand, divided by the degrees of the thermometer, gives the quantity for each degree. The amount will be sometimes in excess, occasionally in defect.”—Dr. D. P. Thomson’s *Introduction to Meteorology*, pp. 447-452.

The following are the results of various comparisons betwixt the aneroid and barometer, made at different elevations, up to 2000 feet above the level of the sea; further than this I have not gone.

The survey-station at Neat’s Tongue, between Trombay and Mehal, exactly 1000.6 feet above the mean level of the sea, as



ascertained by theodolite, afforded a very suitable place for experiment, and the collection of instruments in possession of the Geographical Society offered a most convenient opportunity for determining the point. The beautiful standard barometers by Adie, 2, 3, and 5, were, with three aneroids, now selected for comparison. Barometer No. 4 was left at Balcairn, about 70 feet above the level of the sea, and No. 1 in the Geographical Society's rooms, 35 feet lower, for reference. The first observation was made at 5 P.M., about half-way up the hill, where barometer No. 4 stood at 29·600, temperature 84°; at Balcairn it had stood at 29·874 at 3 P.M., temperature 86°: it had thus fallen 0·274. The three aneroids stood as follows:—

	No. 3187.	No. 1942.	No. 1737.
Aneroid, 70 feet above sea . . . . .	29·945 . . . . .	29·860 . . . . .	29·850
Neat's Tongue . . . . .	29·626 . . . . .	29·552 . . . . .	29·560
Difference . . . . .	<u>.319</u> . . . . .	<u>.308</u> . . . . .	<u>.290</u>

Mean ·306. There was no time to try more than one barometer here. On the top of the hill three barometers were made use of, exactly as at the survey-station; the cisterns were six inches above ground. The following is the result:—

	No. 2.	No. 3.	No. 5.
Barometers, at Balcairn, at 3 P.M. . . . .	29·882 . . . . .	29·849 . . . . .	29·874
Barometers, at Survey Station, at 6 P.M. . . . .	28·966 . . . . .	28·986 . . . . .	28·984
Difference . . . . .	<u>.916</u> . . . . .	<u>.863</u> . . . . .	<u>.890</u>

Mean ·889. The temperature at Balcairn was 5° higher than that above. No correction for this was at this stage made.

Aneroids, as above . . . . .	29·945 . . . . .	29·860 . . . . .	29·850
	28·900 . . . . .	28·888 . . . . .	28·950
Difference . . . . .	<u>1·045</u> . . . . .	<u>.972</u> . . . . .	<u>.900</u>

Mean ·972. Difference from barometric mean ·083.

The following experiments were made at the level of the sea at half-tide, and at Balcairn on the summit of the rock close by:—

	No. 2.	No. 3.	No. 5.
Barometer, lower . . . . .	29·936 . . . . .	29·914 . . . . .	29·926
Barometer, upper . . . . .	.860 . . . . .	.836 . . . . .	.856
Difference . . . . .	<u>.076</u> . . . . .	<u>.078</u> . . . . .	<u>.070</u>
Aneroid, lower . . . . .	29·910 . . . . .	29·830 . . . . .	29·923
Aneroid, upper . . . . .	.840 . . . . .	.770 . . . . .	.850
Difference . . . . .	<u>.070</u> . . . . .	<u>.060</u> . . . . .	<u>.073</u>

The mean depression of the aneroids was thus  $\cdot 067$ , that of the barometer was  $\cdot 074$ ; difference  $\cdot 007$ —seven thousandth parts of an inch.

I took three instruments to Poona with me in the end of July. Two of these belonged to Messrs. Treacher, one to the Society, this last being sadly out of order; the cause of error was not observed at the time, it arose from the slackening of some of the screws, since tightened.

The results were the following:—the standard barometers employed were Nos. 1 and 2, two of the finest sent out by Mr. Adie; the way they kept together was admirable. The mountain sympiesometer referred to was a very elegant instrument procured for Colonel Campbell, whose indications were also very accurate, and in most perfect harmony with those of the other instruments. On comparing the instruments at Senree, about 70 feet above the level of the sea, they stood on the 22nd of July at 10 A.M. as under, the thermometer being  $84^{\circ}$ , the correction for temperature of the barometer here applied  $\cdot 149$ . The standard at the observatory at this date was  $29\cdot 667$ , the instrument being 32 feet above the level of the sea.

Barometers.		Mountain Sympiesometer.	Aneroids.		
1.	2.		5821.	5822.	2244.
29·676	29·662	29·750	29·765	29·790	29·780

The following were the readings of the instruments respectively at Poona at 10 A.M. on the 27th; the observatory standard had betwixt these two dates sunk from  $29\cdot 667$  to  $29\cdot 187$ , or by  $00\cdot 080$ :—

Temperature at Poona  $76^{\circ}$ , barometer corrected,

27·713	27·713	27·830	27·800	27·802	27·650
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Difference betwixt Bombay and Poona—

1·963	1·949	1·920	1·965	1·988	2·130
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The coincidences here betwixt the barometer and mountain sympiesometers, and Mr. Treacher's aneroids, are as close as may be.

These experiments were performed at Colonel Grant's, at the extreme end of the artillery lines; his house is pretty nearly on a level with the church, the top of the spire of which is set down in the trigonometrical survey at 2038 feet above the level of the sea; assuming the spire at 138, this will be 1900. Mr. Treacher's instruments were only cut to 27·5 inches, and that belonging to the Society, cut to 23, was unserviceable, so that the doubt expressed by Mr. Adie, as to whether or not aneroids are

trustworthy below 28 inches for survey purposes, remains unsolved.\*

I took our own aneroid to the top of Bapdieu Ghaut along with me; the following were the results:—but, as already stated, the instrument was unserviceable, so that no conclusion from its indications can in this case be drawn. The perfection of the mountain sympiesometer is very remarkable:

*Bapdieu Ghaut, August 23.*

	Barometer 1.	Sympiesometer.	Thermometer.
Poona, 7 A.M. . . . .	27.952	28.05	76
Bapdieu Ghaut, 9 A.M. . . . .	26.747	26.85	74
	1.205	1.20	—

The barometer is corrected for temperature to 32°.

Since these experiments were made, others have been concluded by Professor Patton, an extract from an account of which, lately read before the Geographical Society, is subjoined:—

*Remarks on the Aneroid.*—Considerable discussion has of late arisen on the subject of the aneroid barometer, and great uncertainty still exists in reference to its utility. A letter from the eminent instrument-maker, Mr. Adie, read before a late meeting of this Society, has tended very much to increase previously existing doubts of its usefulness in ascertaining high altitudes, for which its portability and cheapness would have made it particularly suitable. This Society also having ordered a supply from England, it is of great importance not only to have those doubts set at rest, but also to have some means of testing their correctness, in order to inform purchasers of the limits within which they can be trusted. In order to do so, I obtained two aneroids, one belonging to Mr. Treacher, graduated to 27.5 inches, and one belonging to the Society, graduated to 23 inches, and subjected them to the following experiment. In the neck of a flask containing a small quantity of mercury, I inserted a small bent tube, and when the flask was inverted, the mercury of course stood at the same level in the flask and in the tube.

“The flask was properly supported on a small retort stand, and the aneroids were then placed under the receiver of an air-pump, and a few strokes given to the pump. When the air became a little rarified in the receiver, the elastic force of the air in the flask pressed down the mercury, and the degree of exhaustion was measured by the altitude to which the mercury rose in the tube. Therefore, neglecting for the present the diminution of the elastic force of the air in the flask, arising from the increase of volume, and neglecting also the change in the temperature under the receiver, the *rise* of mercury in the tube should be exactly equal to the *fall* indicated by the aneroid,

\* On this point see Professor Patton's Observations at Mahabuleshwur, and also those of Colonel Yorke on the Puy de Dome, &c., in this No. of the Journal.—Ed.

and *vice versa*. And this was the case in each of the experiments, as will be seen from the readings given below. The air was first pumped out, and the receiver not being perfectly air-tight, it re-entered gradually, and readings were taken at the same instant by myself and Mr. Ardaseer Framjee.

## TREACHER'S ANEROID, No. 1.

Aneroid.	Height of Mercury in Tube.
Inches.	Inches.
27·5	2·55
28·0	2·25
28·5	1·55
29·0	1·05
29·5	0·55
30·05	0·00

## ANEROID No. 2.

First Experiment.		Second Experiment.	
Aneroid.	Height of Mercury in Tube.	Aneroid.	Height of Mercury in Tube.
Inches.	Inches.	Inches.	Inches.
26·0	3·9	24·5	4·75
26·5	3·35	25·0	4·25
27·0	2·8	25·5	3·7
27·5	2·35	26·0	3·2
28·0	1·85	26·5	2·7
28·5	1·35	27·0	2·2
29·0	0·85	27·5	1·7
29·25	0·6	28·0	1·2
		28·25	1·975
		28·5	0·7
		28·75	0·425
		29·0	0·2
		29·7	0·5

"In the first experiment the aneroid rose 2·55 inches, and the mercury fell the same; in the second, the rise is 3·25 inches, and the fall 3·3; and in the third, the rise is 5·2 inches, and the fall 5·25 inches.

"This close coincidence is remarkable, and requires to be accounted for, and explained, because it would really indicate a considerable error in the aneroid, rather than prove its exactness. In the last experiment, the mercury in the tube fell 5·2 inches: the volume of the air in the flask was therefore lessened, and consequently its elastic force increased. This increase I ascertained by measuring the volume of the air in the flask, and the volume of 5·2 in. of the tube to be equal to a pressure of ·27 of an inch of mercury. The aneroid, therefore, instead of coinciding, should have differed by this amount from the reading of the tube; that is, the mercury should have fallen less than the aneroid by ·27 of an inch. But a little consideration of the circumstances of the case will account for the discrepancy, and prove that in this large range of 5·2 inches the aneroid differed by a

less quantity than  $\cdot 27$  of an inch from the truth. The total fall of mercury in the tube should be diminished by the rise of the mercury in the flask, and this must have amounted to about 1-10th of an inch. The mercury used in the experiment was not pure, and should be corrected for temperature; and therefore the fall, which seems to represent a change of pressure of 5.25 inches, must be much less, and when the increased pressure in the flask is then added, the discrepancy will be inconsiderable. I have not been able to ascertain the amount of error due to these causes, nor to the change of temperature of the air in the receiver, but in future observations with more perfect apparatus I shall be able to do so. From these experiments I felt satisfied that the aneroid No. 2 would not differ from a mercurial barometer by more than 1-10th of an inch, if carried to a height of 6000 feet. Since these experiments were made, I have had an opportunity of taking it with me to Mahabuleshwur, and of comparing it with the sympiesometer, and the results given below show how accurately my anticipations have been fulfilled—at least, as far as 4500 feet. Dr. Buist's observations at Poona had already proved its correctness to the height of 2000 feet.

	Aneroid.	Sympiesometer.	Thermometer.	
Oct. 19.	29.8	. . 29.56	. . 90.0	12 o'clock at noon—level of sea.
„ 19.	27.725	. . 29.5	. . 8.5	3 ditto ditto.
„ 20.	29.85	. . 29.65	. . 83.6	9½ A.M., Mhar River.
„ 20.	29.155	. . 28.93	. . 85.5	5¼ P.M.
„ 20.	25.79	. . 25.54	. . 68.5	9½ P.M., Monastery, Mahabuleshwur.

“The coincidence between the two instruments is seen to be very exact, the total fall of the aneroid being 4.01, and of the sympiesometer 4.02.

“The following are the readings of the aneroid and thermometer at different places between Mahabuleshwur and Poona:—

	Aneroid.	Thermometer.	
Oct. 21.	25.756	. . 65.0	9½ A.M., Monastery, Mahabuleshwur.
„ 21.	25.9	. . 68.0	4 P.M., top of Tai Ghaut.
„ 21.	27.175	. . 72.0	5 P.M., bottom of ditto.
„ 22.	27.75	. . 73.5	Top of Ghaut.
„ 22.	27.88	. . 75.5	Bottom of ditto.
„ 22.	26.725	. . 81.0	Top of Ghaut near Poona. 6 P.M.
„ 22.	27.87	. . 80.0	Poona lines. 10 P.M.
„ 23.	27.77	. . 81.5	Ditto 4¼ P.M.
„ 23.	27.87	. . 78.5	Ditto 10 A.M.

“A very slight examination of these observations will show how sensibly the aneroid is acted on by the smallest undulations of the ground, and it acts as freely at 25 inches as at 30.

“They make no pretence to great accuracy, because most of them were taken when the palkee in which I was carried was in actual motion, but this only proves more strongly the value of the instrument for general purposes.

“When the merits of the aneroid become known, and confidence is placed in its indications, it will probably supersede all other portable instruments for ascertaining the heights of mountains: I have there-

fore prepared the following table, which will enable any one who can multiply and divide to obtain altitudes with all the accuracy that is required for practical purposes. The formula used in the calculation is given by Poisson in the second volume of his 'Traité de Mécanique:—

$$Z = 18398 \dots \left( 1 + \frac{2(t+t')}{1000} \right) \text{Log.} \frac{h}{h'}$$

where  $t$  and  $t'$  are the temperatures of the air in degree of the centigrade thermometer at the two places of observation,  $h$  and  $h'$  the length of the barometric columns, and  $Z$  the highest in metres.

TABLE to facilitate CALCULATIONS OF HEIGHTS OF MOUNTAINS.

32°	52416	47°	54168	62°	55901	77°	57658
33	52532	48	54280	63	56027	78	57774
34	52649	49	54396	64	56143	79	57890
35	52765	50	54512	65	56260	80	58007
36	52882	51	54629	66	56376	81	58124
37	52993	52	54745	67	56493	82	58240
38	53115	53	54862	68	56609	83	58356
39	53231	54	54979	69	56720	84	58472
40	53348	55	55095	70	56842	85	58539
41	53464	56	55211	71	56959	86	58706
42	53581	57	55328	72	57055	87	58823
43	53697	58	55444	73	57192	88	58939
44	53814	59	55561	74	57308	89	59055
45	53930	60	55677	75	57424	90	59172
46	54046	61	55794	76	57541	91	59288

“ *Rule.*—Multiply the number in the table opposite to the mean of the temperatures of the two places in degrees of Fahrenheit, by the difference of the barometric heights, and divide by their sum. The quotient is the height in feet.

“ *Example.*—On the 20th of October, 1850, the barometer stood at 29·85 in the Mhar river near the sea, the thermometer indicating 83·5; and at the Monastery Mahabuleshwur it fell to 25·79, and the thermometer to 68·5. Required the height. Here the mean temperature is 76°, opposite to which in the table is found 57541, which being multiplied by 4·06, the difference, and divided by 55·64, the sum of the barometric heights, gives 4198 feet, the height required.

TABLE of HEIGHTS found by the ANEROID.

	Feet.
Kenesoxe, above the level of the sea . . . . .	665
Mahabuleshwur, ditto . . . . .	4198
Mount Charlotte, above Monastery . . . . .	324
Mount Charlotte, above the level of the sea . . . . .	4524
Tai Ghaut . . . . .	1862
Height of Ghaut, above Poona . . . . .	1216
Poona, above the level of the sea . . . . .	2025

“ These heights, as far as I have been able to ascertain, coincide very nearly with the heights ascertained by other means. Indeed no single observation of the barometer at one of the places could be expected to give it more accurately.

“Leslie’s rule is very convenient, and sufficiently accurate; but the correction for the temperature of the air at the two places is often neglected in practice—and even in some scientific works the fact of a correction being required is not mentioned. But this correction cannot be omitted, because in the case of Mahabuleshwur it amounts to upwards of 400 feet, and in the case of Poona to about 180 feet. The results, however, are always too small, because in his investigation he was only anxious to obtain an approximation, and neglected systematically all but round numbers; and all the omissions tended to reduce the apparent height. Near the equator, the diminution of the force of gravity is another source of error, which still more diminishes the height deduced from the usual formula. I have therefore used, in the formation of the table given above, the number 52416, deduced from Poisson’s formula, in preference to 52000 used by Leslie. Besides, the thermometer in general use being graduated according to Fahrenheit’s scale, it is inconvenient to be obliged to convert the degrees into those of the centigrade. As some persons may prefer the use of his rule, I add it, with the example given above worked out:—

“*Leslie’s Rule.*—As the sum of the mercurial columns is to their difference, so is the constant number 52000 feet to the approximate height. Correct the approximate elevation by shifting the decimal point three places back to the left, and multiply by twice the sum of the degrees of the detached thermometer: this product being now added, will give the true height.

“Taking the former example, we have,  $55.64 : 4.06 :: 52000 : 3798$ , the approximate height, and the correction is  $3.798 \text{ ft.} \times 99.7 = 378$ , which gives for the true height 4171, differing from the former by 27 feet.

“Of the more minute daily variations, and the corrections, if any, that are to be applied, I hope to be able to have some account for the next meeting of the Society.

“21st Nov., 1850.”

“JOSEPH PATTON.”

The dial plate, as we shall call it, is about four inches in diameter; the scale is engraven about half an inch in from the edge of the dial, it is by consequence nine inches in circumference, and when engraven all round is divided from 23 to 31, or over a space of eight inches, each space corresponding to a barometrical inch, being thus in reality 1.125 inches: this is divided into tenths, each tenth being subdivided into quarters, so that the instrument reads to 0.025; it may be extended to half this, or to 0.0125.

The space betwixt the present scale and the extreme edge of the dial, half an inch in breadth all round, is occupied on the one side by the words stormy, much rain, rain, change, fair, and set fair—calculated in India only to mislead; these ought in all cases to be omitted, and the thermometer, which occupies the other side

of the dial, should be sunk underneath it, so as not to interfere with the scale, or sweep of the index. The scale should be cut at the extreme outer edge of the dial plate; by this a fourth would be gained in space without altering the mechanism or form of the instrument. An inch will thus be represented by a space of 1.5 in length, instead of 1.125, and this may easily be subdivided into hundredth parts, capable of being estimated to half this, or to 0.005. Troughton's marine barometers, when meant to read without a vernier, are cut to hundredths of an inch, each division being a third less than what I have recommended for the aneroid. As already stated, the brass index is a mere encumbrance, endangering the glass, and continually in the way; it ought at once to be abandoned. The steel index ought to be made much finer, and more delicate than at present, as fine, in fact, as the seconds hand of a watch: just now it occupies a space corresponding to about two-hundredths of an inch. Reducing its dimensions has another advantage besides improving the delicacy of the reading—it diminishes its mass and momentum, and so rids us of tremor and vibration when the instrument is moved about.

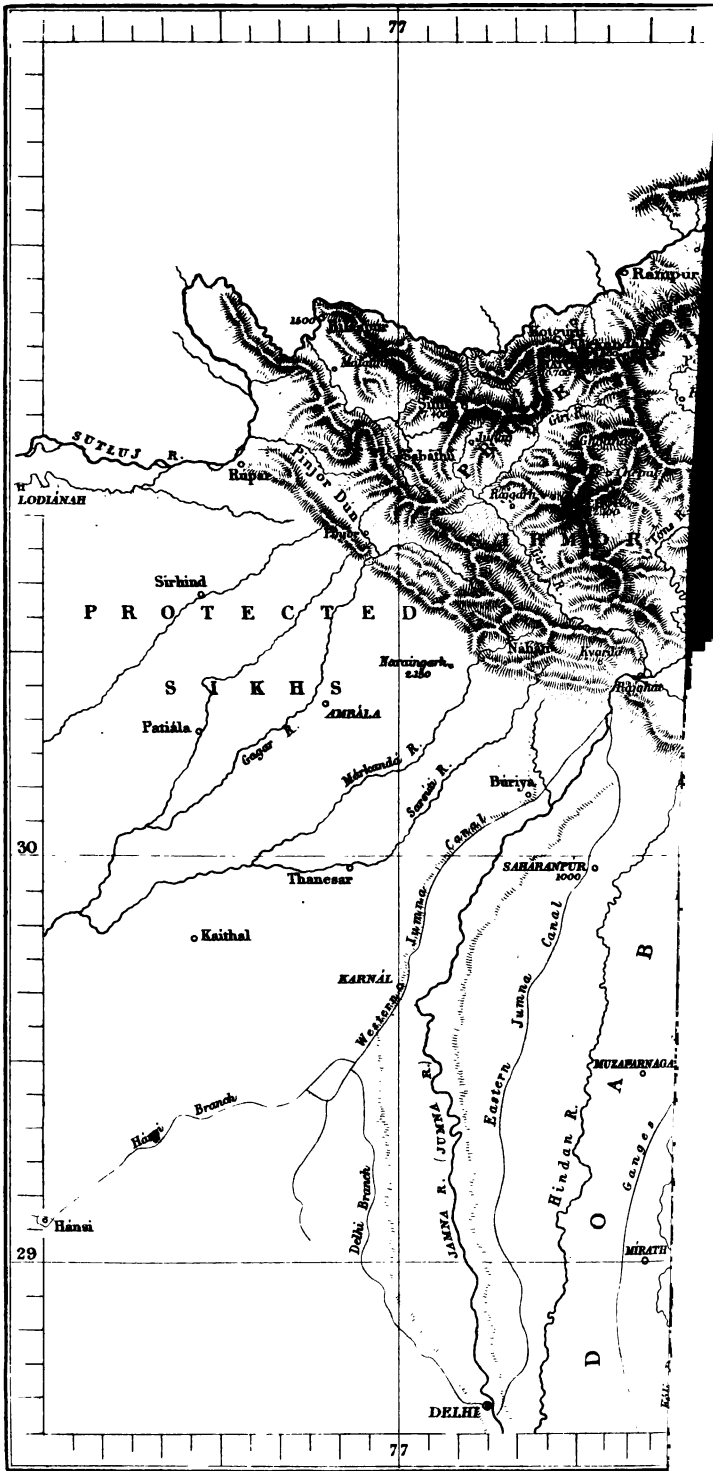
The improvements suggested are all too obvious to require to be more than mentioned; they can be carried out without in any way increasing the expense, size, or complexity of the instrument, and ought to be insisted on by all those ordering aneroids for surveying purposes, or for service of any sort in India.

Should Mr. Adie's surmise prove correct, and the aneroid at pressures under 28 inches cease, as at present cut, to harmonize with the barometer, it would be well, with an instrument so compact and convenient, to see whether a series of aneroids could not be so made as to serve in succession for any ordinary elevation; or whether the portions of the scale lower than those on the common aneroid might not be so altered as to afford the correct pressure. One instrument might serve for the first 2000 feet, a second when only marked up to 28 inches might carry us 2000 feet higher, and so on. The matter might be very easily determined under the receiver of an air-pump, without actual ascent, the barometric gauge, with a good scale, answering as well as the barometer itself.

The neatly glued, leather-covered, velvet-lined box, in which the aneroid is enclosed, is totally unsuited to India: a hot Deccan wind will warp, twist, and split it in pieces; a wet monsoon atmosphere dissolve all the glue, mould the stuffing, and rot both leather and velvet. To meet the risks of climate and rough usage, it ought to be provided with a strong brass, copper, or zinc box, of its own form, but some inch greater in diameter and







so as to present half an inch of clear space all around. It might be stuffed with hair, with scraps of cork, or with rubber, or fitted up with springs—fitted up in some such way to diminish the risks of concussion or vibration. Were the case after this sewed round with soft leather, like the cover of a spy-glass or powder-flask, and the instrument made to sling over the shoulder, it would, I think, be so thoroughly protected as to reduce the risk incurred to a mere trifle.

In the case of this, as in that of all the other instruments, it might be a maxim that weight with us is always a secondary consideration to security; and that all the dangers likely to be encountered should be provided against at home; and it should never be forgotten that nothing that will warp with heat, such as a thin piece of board, soften with any amount of damp combined with moisture, such as glue or gum, or attract insects, such as paste, or is thoroughly poisoned by corrosive sublimate, should be sent to India; and that as instrument-makers, or even good mechanics, are things almost unknown amongst us, that things apt to get out of order should be made as simple and as easy to take to pieces as possible.\*

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I.—*On the Physical Geography of the Provinces of Kumaon and Garhwál in the Himálaya Mountains, and of the adjoining parts of Tibet.* By R. STRACHEY, Esq., of the Bengal Engineers. Communicated by Sir Roderick I. Murchison.

[Read May 12, 1851.]

ALTHOUGH we are still almost entirely dependent upon Chinese geographers for our topographical knowledge of what has been called Central Asia, some small accessions to our stock of information are gradually being made which render it necessary for us to modify from time to time our preconceived ideas of the physical nature of this region, from which European travellers still continue to be most jealously excluded by the policy of the Chinese, who are everywhere paramount between Siberia and India.

The comparatively small elevation of the greater portion of this "terra incognita" was, I think, first pointed out by Humboldt, and we were taught by him, most correctly, that the high lands were confined to its more southern parts, which are commonly known to us under the name of Tibet.

This elevated region, to which it is that I now propose to direct your attention more particularly, extends through nearly 30° of

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\* See also the Paper by Lieut. Kay, R.N., Director of the Royal Observatory, Hobart Town, in the Journal of the Royal Society of Van Diemen's Land, p. 83, Jan. 1850.—ED.





Part of the  
HIMALAYA MOUNTAINS,  
to illustrate  
Capt<sup>n</sup> Strachey's Paper  
1851.



longitude from the sources of the Oxus to those of the Hoang-ho, the Yellow river of China. We are familiar with the mountains that abut upon, and indeed form its southern edge, as the Himálaya; while there seems every reason to suppose that the chain that appears upon our maps as the Kouenlun in like manner forms its termination to the north. The plains of northern India, whose greatest elevation above the sea is not more than 1200 feet, are spread out for an extent of upwards of 1500 miles along its southern face; the countries around Yarkund and Khoten forming an equally striking plateau, from which it rises on the north, at an altitude that can hardly exceed 3000 feet, as we may safely infer from the nature of its vegetable productions.

The journeys of our modern travellers have been almost entirely confined to the southern or Himalayan border of this region, and its northern declivity has only once been reached. Little is known of the interior or more northern parts, with the exception of Ladák, and the countries that lie on the upper portions of the Indus. It is therefore impossible to offer any general account of it based upon actual observation, but as far as we can judge from those parts that have been explored, and from the accounts that can be gleaned of the rest, it appears to be with few exceptions broken up into a mass of mountain, the average elevation of whose surface is very great, often exceeding in altitude 15,000 feet. I would further add, that it is the opinion of my brother Captain Henry Strachey, whose prolonged residence in Ladák, and whose general familiarity with the north-western Himálaya, give him the best means of forming correct conclusions on such points, that neither the Kouenlun, nor the Himálaya, as marked upon our maps, have any definite special existence as mountain chains apart from the general elevated mass of Tibet. That rugged country thus seems to form the summit of a great protuberance above the general level of the earth's surface, of which these two chains form the north and south faces. All my own observations lead me to concur entirely in this opinion.

Having thus attempted to give some general idea of the main features of this very remarkable region, I shall proceed to illustrate rather more fully some of the more striking physical peculiarities of those parts of the mountains in which my own personal observations have been made; viz. the British Himalayan provinces of Kumáon and Garhwál, and the part of Tibet that is immediately contiguous to our frontier. And in doing this it is necessary that I should explain that, although there seems to be much general similarity in the structure of the various parts of these mountains, yet that my remarks are only to be considered as strictly applicable to the particular region that I have just specified unless the contrary is distinctly stated.

I would here also add, that it is altogether to Mr. Thomason, present Lieut.-Governor of the north-western provinces of India, that I am indebted for the opportunities I have had of the researches of which I am about to give a short account; I having been employed by the Indian Government, at the gentleman's suggestion, for this special object, during the years 1848 and 1849.

#### CONFIGURATION OF SURFACE.

*Plain of India.*—Along the whole of the southern face of the Himalaya, from the débouché of the Indus to that of the Bráhmahputra, extends a vast unbroken plain, which is prolonged southward to the Bay of Bengal near Calcutta on the one hand, while on the other it follows the Indus through the Punjab and Scinde to the Arabian Sea, covering in all an area of nearly 500,000 square miles. The highest portion of this plain is that between the rivers Sutlej and Jumna, and its elevation along the foot of the mountains is probably about 1200 feet above the sea.

*Siwalik Hills.*—The transition from the plains to the mountains is sudden and well defined. A line of hills that has been called the Siwalik or sub-Himalayan range, and that will be well known to geologists by the striking palæontological discoveries made there by Dr. Falconer and Colonel Cautley, rise abruptly and without any intermediate undulating ground from the apparently perfectly level surface of the flat country. Their elevation varies from a few hundred to three or four thousand feet. These hills seem to have, with hardly any exception, a well-defined existence along the whole of the southern edge of the Himalaya, presenting much the same general features along the entire line of mountains.

*Duns.*—The strata of which they consist usually dipping inwards towards the general mass of the mountains, a steep face is turned towards the plains, while a long gentle declivity slopes inwards and forms a shallow valley by meeting the foot of the next line of mountains that runs on the whole parallel to the outer line, but from five to ten miles further in. This longitudinal depression, as may be supposed, is by no means continuous, but is broken up into separate short valleys by the occasional partial confluence of the two ranges of hills that usually form distinct lines, and by the passage of the streams that drain the interior of the mountains. The floors of these valleys generally appear to be covered with a deposit of boulder and gravel that slopes somewhat steeply from the great mountains that bound them on the north, so that the whole is considerably raised above the level of the plain without, reaching an elevation of about 2500 feet above the sea. The drainage of these valleys usually collects along their longitudinal

axis, and either falls into some of the larger streams that cross them, or less frequently by a sudden bend to the south finds an escape for itself into the plains through a rupture in the low outer line of hills. These valleys are in the country with which I am acquainted called "Dún," and according to Mr. Hodgson they are termed "Mári" in Nepal.

*Tarái.*—I may here mention that in some works on Physical Geography these valleys have been confounded with what is locally called the "Tarái," or "Tariyáni,"—a thing totally distinct. Along the southern edge of the outer hills extends a band of 10 miles or so in breadth, usually covered by forest, and remarkable for its utter want of water. All the minor streams, as they leave the hills, excepting when swollen by the periodical rains, are rapidly absorbed and disappear in the sandy and shingly deposits that there prevail; and wells have to be sunk to a great depth throughout this tract before water can be met with. The surface slope of this absorbent band is very considerable near the hills, but rapidly diminishes as we recede from them, and we usually find that at a distance of from 10 to 20 miles from the foot of the hills the character of the country changes rather suddenly, the extremely dry forest belt being succeeded by a line of swamp clothed by a thick growth of reeds and grasses.

It has been often supposed that this swampy tract, which is the true *Tarái*, was formed by an actual depression in the general surface of the country, but this seems to be altogether an erroneous idea, the truth being that along this line the drainage of the higher country beyond breaks out in copious springs that collect into swamps, partly perhaps from artificial obstructions made for the purpose of utilizing the water for irrigation, but chiefly I conceive from the small slope of the country through which the drainage has to be carried off, which can only amount to a few inches in the mile for a distance of many hundred miles from the sea. We see accordingly that this peculiar feature is confined to the country to the east of the Ganges, the general level of which is considerably less than that to the west of that river.

*Mountain Region.*—The mountains that I have already alluded to as forming a line on the whole parallel to the outer hills, but from five to ten miles further in, rise somewhat suddenly to an average elevation of perhaps 7000 feet, and with these we enter the great mountain region that extends to the north over a breadth of upwards of 500 miles. For a distance of from 60 to 70 miles from the outer range of hills we find that the mountains are usually of no very great height, their summits rarely exceeding 10,000 feet in altitude. They then, however, again rise rather abruptly and form that wonderful range of snowy mountains that surpasses in its elevation all other parts of the earth's surface now known to us.

**Great Peaks.**—The loftiest peaks are generally met with from about the 80th to the 90th mile from the southern edge of the chain. Late measurements have shown that more than one of these peaks exceeds 28,000 feet in height : in the districts with which I am conversant, which have been more completely surveyed than the rest of the mountains, there are five or six peaks that are above 24,000 feet, and the number that exceeds 20,000 feet is very great. The great peaks in Kumáon and Garhwál, as may be seen by a reference to the map, are not found on a continuous ridge, but are grouped together in masses, that are separated one from the other by deep depressions through which flow the streams that drain those parts of the mountains that are immediately contiguous to the north. So far as we can judge from the very imperfect maps of the parts of the Himalaya to the east of these provinces, the same sort of arrangement appears to hold there also ; the great peaks being found in detached clusters arranged along the same general line at a distance of about 80 or 90 miles from the southern extremity of the mountains, while the drainage of a considerable portion of the country to the north of them passes through the deep gaps that lie between the different groups. To the west of the Ganges something of the same tendency may be traced, but much less distinctly.

**Valleys.**—The valleys that traverse the mountains between the snowy ranges and the plains are for the most part little more than gigantic ravines, at the bottom of which flows the river each contains, in a very contracted channel, which at intervals only opens out into an alluvial flat, capable of cultivation. The level of the bottom of these valleys is, of course, very various ; but in tracing up the courses of the larger streams we usually arrive within 10 miles in a direct line from the snowy peaks, without having risen to more than 4000 or 5000 feet. In proceeding, however, we find that where we cross the line on which the great peaks are situated the ascent very rapidly increases, and a very few miles carries the river-bed up to an altitude of 9000 or 10,000 feet : thus showing that the sudden increase of height of the mountains along this line is not confined to the peaks alone, but is a general elevation of the whole surface. As we pass to the north from the line of greatest elevation, the diminution of the altitude of the ridges is not much, while the level of the bottom of the valleys is constantly increasing in height ; it is, therefore, not improbable that the mean height of the whole may actually increase as we recede from the great peaks until we reach the watershed of the streams that flow to the S., which is found at about 25 miles to the N. of those peaks.

In passing through the most elevated portions of the mountains, the traveller, who naturally expects to see scenes of surprising



magnificence amid these gigantic snow-clad pinnacles, is too often doomed to be disappointed; for, in his painful progress along the narrow gorges that traverse these regions, he can but seldom see anything beyond the rocks that frown immediately over his head. Exceptions however there are, though few, to this rule, and we are sometimes able to snatch from the summits of the higher passes, in the rare intervals during which they are not shrouded in mist, views of stupendous and chaotic masses of mountain that fill the mind with astonishment and awe.

*Passage into Tibet.*—Nor is the scene that presents itself, when we at length reach the watershed, less remarkable. After weeks have been spent in traversing mountain after mountain, of the seeming interminable succession of which the eye begins to tire, while the incessant roar of the torrents that rush by begins to weary the ear, we are here suddenly arrested by seeing spread out before us a plain, that without sign of water, of vegetation, or of animal life, stretches away, as far as the eye can reach, in a north-westerly direction; behind which rise mountains that gradually fade away in the distance, with here and there only a peak lightly tipped with snow.

*Elevated Plain.*—This, in fact, is the very plain which was seen by some of the earliest missionary travellers in Tibet, and the account of whose existence gave rise to the idea that the whole country was a vast plain of immense altitude. When it became apparent, as it ultimately did from the accounts of subsequent travellers, that a great part of Tibet was a confused mass of mountain, doubts were thrown on the existence of any plains at all, and it has become necessary, so to speak, to re-discover this very remarkable feature of these mountains.

The plain immediately to the N. of the British Himalayan provinces is about 120 miles in length, and 15 to 60 in extreme breadth. The mountains that bound it to the N., as I have already noticed, hardly appear to be what we should call snowy, and they are by no means so high as the ranges of the Himalaya on its southern edge. The height of the celebrated peak Kailás has been determined by purely trigonometrical operations to be not quite 22,000 feet; while another peak, more to the W., one of the few that just entered the region of perpetual snow, was similarly found to be little above 20,500 feet.

The surface of the plain itself, which has been traversed throughout its length by my brother Captain Henry Strachey, as well as to a less extent by myself, in company with Mr. Winterbottom, varies in elevation from above 16,000 feet along its southern edge to about 15,000 in its more central parts, where it is cut through by the river Sutlej, which flows at the bottom of a stupendous ravine furrowed out of the alluvial matter of which

the plain is composed to a depth not much less than 3000 feet. Such ravines, the slopes of which are often almost as even and straight as those of a railway-cutting for miles together, intersect the western part of the plain, in every gradation of size, up to that of the Sutlej; and such is their extraordinary magnitude that Moorcroft, a traveller of great accuracy in general, in his account of his journey across this country invariably talks of their slopes as mountains, and apparently altogether overlooked the existence of the plain out of which they are cut. The streams that flow at their bottoms are so exceedingly small when compared to the vast size of the watercourses themselves, that it is not easy to bring ourselves to believe that they have been excavated altogether by such diminutive means; and some of the ravines, of very considerable dimensions, are evidently always quite dry, excepting during the period when the winter snow is being melted off.

As we advance into the eastern parts of the plain, we find that it gradually becomes more obstructed with mountains, which rise abruptly from the level surface like islands and rocky coasts from the sea; and if at any time it requires but little effort of the imagination to reproduce to the mind the picture of the days long gone by, when an ocean rolled over this expanse, now upraised above the level of the highest of the puny mountains of Europe, even that little is sometimes not needed when the mirage that plays over the arid surface of the ground, under the influence of the intense heat of the sun's rays, unrolls before the eye its fairy vision of the things that were.

*Lakes.*—The lakes Rákas Tál and Mánasarowar, so celebrated in the sacred legends of the Hindús, lie at an elevation of about 15,200 feet above the sea, and form the eastern limit of our explorations in this region. The varied outline of the former lake, with its islands and innumerable headlands, the intensely lovely blue of its waters glittering in the sun under a cloudless sky, with ten thousand snow-white breakers that covered its surface and dashed against its rocky coasts, while Kailas reared its glorious dome of snow in the background, formed a picture of uncommon beauty; but the effect of the scene was greatly marred by the utter desolation of everything; and any real enjoyment was entirely destroyed by the bitter blasts of the southerly wind, which, while it lashed the water of the lake below us into admirably picturesque breakers, did not fail to chill us to the very bones.

*Source of Sutlej.*—A stream, the head of which we visited, flows from Mánasarowar into Rákas Tál, and the latter occasionally, when high, sends off a feeder into the Sutlej; the main sources of this river, however, are possibly in the streams that fall into it from the Himálaya, 10 or 15 miles to the W. of Rákas Tál.

*Of Indus.*—One of the feeders of the Indus, but not a principal one, likewise takes its rise a little to the N. of these lakes. I am informed by my brother Captain H. Strachey, that the main supply of water in the upper part of the Ladák Indus is derived from the Zangskár river, which has its origin among mountains corresponding in position to the snowy peaks of Kumáon and Garhwál; while the other affluents, though probably longer, rise in a much drier climate, and contain a far less bulk of water.\*

My friend Mr. J. E. Winterbottom, who has visited the junction of the two great branches of the Indus, the Shayok and Ladak streams, is inclined to consider the former the more important.

*Of Ganges.*—I may here also notice that on no principle whatever can the glacier at Gangotri be considered as the true source of the Ganges. The Bhágirathi, which rises from that glacier, is usually looked upon as the main stream of that famous river, but it has, in truth, no claim to such a title, excepting inasmuch as it is the sacred stream of the Hindú mythology. The Alaknanda, the other great feeder of the Ganges, is nearly twice the size of the Bhágirathi, and the most distant sources of the former river are certainly more remote than any of the latter. Taking for granted that the Bhágirathi was the true Ganges, Captain Herbert, one of the earliest explorers of this country, suggested that the Jáhnvi, a river that joins the Bhágirathi a little below Gangotri, was the true source of the Ganges. It has also been supposed that the Jáhnvi rose from the N. side of the Himálaya, in the same manner as the Sutlej; but this is not the case, the usual watershed range being as strongly developed across its head as elsewhere. On the whole, therefore, it is certain that the true source of this great river is to be found in that of the Dhauli, which takes its rise to the N. of the village of Niti, most probably in the stream called Raikhanda.

*Of Bráhma-putra.*—Regarding the source of the Bráhma-putra we have no real information. It appears, however, most probable that a strip of Tibet, 20 or 30 miles broad, along the northern face of the watershed, drains through the Himálaya into the Ganges, as far eastward, at least, as the meridian of Calcutta, and possibly farther; and that the Sánpur Tachok-Tsangpu (Tibetan), which must surely be the Bráhma-putra, rises to the N. of this belt in a manner similar to the Indus. We cannot, therefore, say with any great degree of probability that the source of the Bráhma-putra is to be found in the immediate vicinity of the lake Mánasa-rowar, but indeed rather the reverse; though it is not unlikely that the drainage of the N.E. face of the E. portion of the Kailás range may fall into the Sánpu.

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\* This view is also taken by Moorcroft.

Although we have no very certain proof of the recurrence of plains, such as I have described, in other parts of the chain, there seems to be some reason for supposing that the plain of Pamir, so well known from the accounts of Marco Polo—the existence of which is fully corroborated by Lieutenant Wood, of the Indian Navy—may be its representative on the W. ;\* while to the E., the plains passed over by Turner during his embassy to Tibet—the accounts of which are quite confirmed by Dr. Hooker—as well as others mentioned by Kirkpatrick as existing to the N. of Nepal, are not improbably also of a similar nature.

*Systems of Drainage.*—It will, I think, be found to assist us in forming a distinct idea of the general arrangement of the mountains if we observe the courses of the rivers that drain them. In doing this, we are at once struck by the circumstance that they almost universally flow in directions either parallel to the general direction of the chain, or perpendicular to it. We may thus distinguish several different orders of streams, all following this general law:—1st. Those that drain the lower parts of the mountains. 2nd. Those that rise immediately to the N. of the great peaks, passing between them in channels on the whole perpendicular to the chain; such are the main affluents of the Ganges, and many of the rivers of Nepal. 3rd. Those that have a considerable portion of their course parallel to the chain, and then suddenly turning to the southward issue from it in a direction at right angles to their upper parts; such are the Sutlej and the Chenab, and similar rivers are to be observed at intervals in the eastern parts of the mountains. 4th. The streams that collect the drainage of the more northern parts of the elevated region of Tibet, the upper parts of whose courses are usually longitudinal, while they also pass from the mountains to the S. in a direction nearly perpendicular to the chain. Of such rivers there appear to be two only: the Indus, that drains Western Tibet; while it is probable that the Sánpu performs a similar office for Eastern Tibet, in like manner also passing from the mountainous region to the S., under the name of the Bráhmáputra.

#### GEOLOGY.

The general parallelism of so many of the main features of these mountains, such as the courses of the rivers to which I have just been alluding, and as a natural consequence of the ridges between which they pass, of the line of greatest elevation, and of the line of low hills along their southern edge, seems to indicate the probability of some general agency as the cause of all of them, a result that the examination of the geology of the country entirely confirms.

\* My brother, Capt. H. Strachey, who has returned to England since this paper was sent to press, tells me that he has reason to doubt the existence of any Pamir plain.

The strike of the strata in all parts of the chain that have been examined follows its general direction, which in the districts that have been specially examined by myself, and to this region alone I shall now restrict my observations, is from W.N.W. to E.S.E. The dip is similarly most commonly to the N.N.E., but it sometimes suddenly changes to precisely the reverse, or to the S.S.W. The deviations from this rule form but a small number of exceptions, which appear to result from disturbances of limited extent. The dip to the N. of the great snowy peaks, although still on the whole northerly, seems to have a tendency to the W. rather than to the E., but from the shattered state of the strata it is difficult to come to a satisfactory conclusion as to the exact direction.

*Siwalik Hills.*—In following the section that I have drawn out it will be observed that the Siwalik range is tertiary, probably of the Miocene period. We next come to a band of rocks, chiefly sandstones, that is possibly of secondary age, but whose exact geological position is at present very obscure, no fossils having been hitherto found in it, at all events that I know of.

*Central Region.*—The first great mass of mountain which rises over the outer hills and 'Duns' consists of argillaceous schists, grits, and limestones, all devoid of fossils, and it is not till we pass beyond the line of greatest elevation that we find any trace of organic remains to guide us in our speculations as to the age of the strata with which we meet. The whole area between the outer hills or the sandstones that succeed them, and these fossiliferous beds, is made up of every variety of metamorphic rock, amongst which several lines of eruptive action are met with, all following more or less the general line of the strike.

Two lines of granite are thus found to traverse this portion of the mountains, the more northern of which is coincident with the line of greatest elevation, while the southern, which is of a totally different mineral character, appears to have no very marked influence on the elevation of the surface. Several distinct lines of eruptive rocks of the greenstone order have likewise been traced. It may also be noticed that the actual quantity of granite in these districts is on the whole small; the granite that follows the line of maximum elevation is chiefly in the form of veins, and in very few instances expands into mountain masses, the great peaks for the most part being composed of stratified rocks, as may be very distinctly seen from a great distance.

*Silurian.*—Immediately following the crystalline schists that accompany the northern line of granite, we find a considerable thickness of slaty beds, both argillaceous and calcareous, on which rest strata that are certainly of Silurian age. The fossils obtained by me from these beds, the upper part of which rises to a height of between 19,000 and 20,000 feet, have been partially examined

by Mr. Salter, and he has no hesitation in ascribing them to the Silurian period. There appears even to be some reason for supposing that they may prove to contain representatives of the lower Silurian fauna, but my collection not being very large it is not easy to decide such a point, though I may add that M. Barande, who is, I suppose, better acquainted with Silurian fossils than any other naturalist, having seen it when he was in this country a few months ago, expressed his opinion very decidedly that there were many exclusively lower Silurian forms. There are, among the specimens collected from the vicinity of these Silurian strata, shells that appear to indicate the possibility of the existence of Devonian or carboniferous strata, but a more careful examination of the specimens is necessary to settle this point. The total thickness of the palæozoic rocks appears to be about 9000 feet.

*Muschelkalk and Oolite.*—Succeeding the palæozoic strata we find a remarkable bed, apparently quite analogous in the form of its fossils to the muschelkalk of Europe; and still ascending we come to oolitic beds, among which the presence of the Oxford clay is well marked, while the lias seems to be altogether wanting. I am indebted to Professor Edward Forbes for the examination of the fossils I collected from these oolitic beds.

The watershed of the streams that rise to the north of the great snowy peaks, where I have examined it, follows on the whole these oolitic strata, which, equally with the Silurian rocks, attain an elevation exceeding 19,000 feet above the sea.

*Tertiary Plain of Tibet.*—But probably the most remarkable feature of the geological structure of these mountains is that to which I shall next advert. The plain to which I have already directed your attention is found, on examination, to be a tertiary deposit of boulders and gravel, which has attained its present wonderful elevation, above 15,000 feet, without any sensible disturbance of the horizontality of the beds in which it was originally laid out. Bones of elephant, rhinoceros, and horse, the latter apparently identical with the horse of the Siwaliks, also of some large undetermined ruminant, as well as of a new species allied to the goat, are found embedded in these strata.

The existence of such animals in the country in its present state being a physical impossibility, there can be no doubt that these strata have been elevated from some lower level since the time of their deposition. There is no direct proof that these beds are marine, no shells having been got from them, and they might possibly have been laid out by some large body of fresh water at a considerable elevation above the sea; but it appears to me to be far more probable that we have a real sea-bottom to deal with.

The general extension of some of the older fossiliferous rocks

along the northern face of the Himálaya, over a very great longitudinal distance, is a fact of which we have certain proof. It follows, therefore, that the line on which they occur, distant about 20 or 30 miles to the N. of the great Himálayan peaks, has been a sea-margin from the remotest ages of the earth's history till as late, certainly, as the oolitic period. The existence of other plains, apparently of a similar nature, at distant points along the mountains, seems to indicate the probable extension of the body of water by which these tertiary strata were formed, to such dimensions as would, of necessity, show that it was the ocean and no lake.

The present interruption of the plain is no proof that it did not once have a far greater extent. This is sufficiently proved by the fact that I have, at the Niti pass and on the mountain summits near it, traced these tertiary beds to the very crest of the watershed, to a height of 17,000 feet and more; further, 2 or 3 miles below this same pass, on the S., a detached portion of this deposit is to be seen which must clearly have been separated from the general mass by the dislocations of the surface that have upheaved these vast mountains.

From a consideration of these facts it appears probable that this plain has been raised from the level of the sea to its present great elevation since the tertiary epoch, and almost as a necessary consequence it will follow that the present development of the Himálaya and of the elevated regions of Tibet dates no farther back than that period.

*Eruptive Rocks of Tibet.*—It only remains for me to notice, with reference to this elevated plateau, that a great outburst of eruptive rocks, in which are found hypersthene and bronzite, besides sienitic and ordinary greenstones, and various varieties of porphyry, occurs in the vicinity of the lakes. The greenstone is known to extend considerably to the W., and forms the summit, at an elevation of about 17,600 feet, of Balch, one of the Himálayan passes into Tibet, which I have crossed.

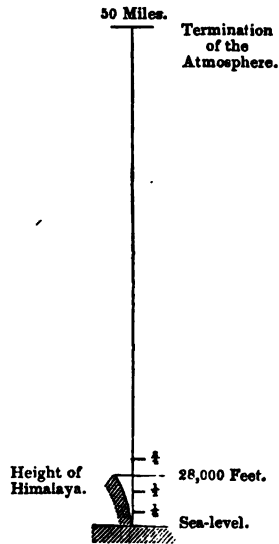
In the extremely hard and non-fossiliferous character of the rocks through which the greenstone passes, there appear to be signs of igneous action on the strata of oolitic age that are generally found along this zone of the mountains. Hot springs are of somewhat frequent occurrence in the higher parts of these mountains, both to the S. of the great Himálayan peaks, and in the plain to the N. of them.

I shall, with reference to this part of my subject, only further add, that the physical unity of the great mass of Tibet with the Himálayan range seems to me very strongly shown by the general geological structure that I have thus briefly attempted to describe; and it appears difficult to account for the peculiar parallelism of all the main features of those parts of these countries with which

we are at all acquainted, otherwise than by the supposition of forces, dependent on some common origin, having acted throughout their whole extent in a direction generally parallel to that of the Himálaya.

METEOROLOGY.

I shall now proceed to give a short notice of some of the more important meteorological phenomena of these regions. But I would first call attention rather particularly to the very small thickness of the atmosphere, or at all events of that part of it that considerably affects us, as compared to the radius of the earth. An immediate consequence of this is, that the inequalities of the earth's surface, that are so insignificant when viewed in relation to the whole globe, become objects of the greatest importance in connexion with the atmosphere. On the accompanying diagram are marked off the heights corresponding to certain definite proportions of the atmosphere, from which it will be apparent that the existence of mountains such as the Himálaya must produce very important effects in modifying the currents of the lower parts of the atmosphere, which, as they contain the great bulk of aqueous vapour, have the greatest effect in determining the character of the climate.



*Perpetual Snow.*—Of all the phenomena presented to the observer of Nature in these magnificent mountains, I know none that can compare in grandeur with that constantly before his eyes in the peaks covered with perpetual snow. In the months of November and December, when the perfect serenity of the autumnal air displays, in a manner with which the pencil of no artist can ever hope to compete, the glorious lights and shadows thrown by the setting sun on this wonderful scene, we may also best observe the extreme altitude to which the snow recedes on the southern face of the mountains. This appears to be about 15,500 feet, as I have shown at greater length in a paper published in the Journal of the Asiatic Society of Bengal, No. 29, of April, 1849. When, however, we pass to the N. of the great peaks and stand on the plain beyond them, it is not without surprise that we shall observe that, in spite of our having advanced far to the N., the snow-line has receded very considerably, so as to



reach 19,000 or even 20,000 feet of elevation. In the paper above alluded to I have already stated my opinions as to the causes of this, and have ventured to doubt the possibility of any radiation from the high land beyond having much to do with the matter. The true explanation of the facts seems to me to be, that the quantity of snow that falls to the N. of the great Himálayan peaks is very much less than that which falls on their southern slopes; and this phenomenon is again to be explained by the consideration that, the prevailing winds over these mountains being from the S., almost all the moisture contained in the air is precipitated on the exterior or southern face of the lofty ranges over which the current passes.

On the plain itself the quantity of snow that falls must be very small, and it can lie on the ground but a very short period. During the summer months it would be quite as impossible to find the least remnant of snow in any part of this tract below a height of 16,000 feet, as on the burning plains of Hindostan. The small quantity of snow is further strikingly exemplified by the fact that the inhabitants of these regions are able to support their flocks of sheep and goats, and herds of yaks, in which their wealth almost solely consists, without making any provision for their sustenance during the winter months; and the semi-nomadic portion of the population that usually congregates during the summer around the pastures that are found in the vicinity of the lakes, appears only to shift its ground a little to the north during the winter to avoid the snow that falls more heavily along the country under the more immediate influence of the lofty ranges of the Himálaya.

I am informed by my brother, who passed two entire winters at Lé, the chief town of Ladák, that the falls of snow that took place while he was there hardly ever exceeded half an inch or an inch in depth.

It is I presume to the sudden change of direction of a great body of moist air, when obstructed by a continuous range of mountains, that we are to attribute the excessive rain that characterizes the windward faces of so many mountains in tropical countries, and the comparatively very dry climate so often found in the country to leeward. The current is constrained to rise over the obstacle that it meets, a sudden condensation of vapour is thus occasioned, and little moisture remains to be deposited in the parts over which the air afterwards passes.

In these mountains this sort of cause and effect is very strikingly shown in many places; in none more than in the upper part of the course of the Dhauli, the river that flows from the Niti Pass. On the southern face of the mountains, generally at an elevation of from 8000 to 11,000 feet, the country is clothed with

dense forest, which is watered by the almost constant condensation produced by the influence of the great mass of mountains that rise suddenly behind. In the case of the Dhauli, however, a great detached line of snowy mountains projects, so as to overlap the upper part of the river course, and the result is most remarkable, for the whole of the upper part of the valley is thus deprived of its fair share of rain by the intervention of this lofty range, which causes the precipitation of almost all the moisture on its southern face, which we find covered with magnificent forest, while the country beyond is converted into what is almost a desert.

*Glaciers.*—In all parts of the mountains covered by perpetual snow glaciers abound, and some of them are of great magnitude. The fact that until within the last few years their existence in the Himálaya was doubted, shows, in a manner that needs no comment, what sort of examination this country, perhaps the most remarkable in the world, has received during more than thirty years of British rule. The lowest level to which I know any glacier to descend is about 11,500 feet, and from that height to 12,000 feet is the ordinary elevation of their extremities. In those parts of the mountains however to the north of the great peaks, where, as I have already observed, the elevation of the snow-line is considerably increased, we also find that the lower extremities of the glaciers recede in a somewhat corresponding degree, the altitude at which they terminate being usually increased to about 16,000 feet.

The velocity of the motion of the ice of course must greatly depend on the peculiar circumstances of each separate glacier; but an analogy with the motion of those of the Alps is sufficiently shown by the few observations that I made to determine this point. The mean of four days' observations in May on the glacier at the source of the Pindar (one of the feeders of the Ganges) gave a velocity of about  $9\frac{1}{2}$  inches for the 24 hours for the central parts of the ice. The same glacier from the 21st of May to the 15th of October moved over 98·57 feet, being at the rate of just 8 inches in the 24 hours. This glacier terminates at an elevation of 11,900 feet. The motion of another glacier, that of the Gori river, close to the village of Milam, which descends to a little below 11,500 feet, was 37·92 feet between the 2nd of August and the 30th of September, being at the rate of about  $14\frac{1}{2}$  inches in the 24 hours.

*Their ancient Extension.*—The question will no doubt occur to every one whether we here, as in the Alps, see signs of the former extension of glaciers much beyond their present limits, or beyond what may be conceived to be the limits of the oscillations to which glaciers are known to be subject in consequence of the ordinary variations of the climate from year to year. And when the reply

is given that everywhere such an extension is to be seen, and that in some places the former development of glaciers appears rather astonishing, it may be surmised that here too there seems to have been a period of cold, a glacial epoch, similar to that known to have occurred over the area of Europe.

But I think that such is not the case. In the first place, it is to be observed that neither on the plains of India nor on those of Tibet are erratic blocks to be seen. Boulders there are in any quantity, but of those great masses for the transport of which some other agency than that of the waves or tides is requisite we have no trace. It is further to be noticed that in passing through the Tibetan plain we crossed two very remarkable accumulations of earthy and stony detritus that were evidently the moraines of ancient glaciers; they extended from the N. face of the Himálaya along the courses of two streams that are known to rise in glaciers now quite withdrawn within the mountains. The ancient moraines project for a mile or two fairly out into the plain; and as the surface of this was quite clear immediately in front of them, it is manifest that the formation of these moraines must have taken place subsequently to the exposure of the plain to the air, and not while it was under water; for in the latter case we could hardly have failed to have seen the plain strewn with blocks derived from the glacier.

Now if we observe the manner in which the plains of northern India run right up to the Siwalik hills, without any sign of intermediate undulating ground, I think that it appears almost certain that the ocean that laid out and levelled this vast expanse of flat country to the south of the Himálaya must have continued to extend up to the foot of the Siwalik range after its upheaval. If again the tertiary strata of the Tibetan plain are of the same age as those of the Siwaliks, as is probable, we may fairly suppose the upheaval of the two to be geologically synchronous. We should then have had a state of things in which Tibet and the Himálaya generally might have existed much as at present, only that the ocean washed the very foot of the mountains, instead of being distant as it now is a thousand miles and more. The evident result of this would have been that the Himálaya would have then had a far wetter climate, and that the quantity of snow that fell on the highest parts of the mountains would have been greatly in excess of what now falls, thus causing a great extension of glaciers, such as we see actually to have taken place. The ultimate elevation of the plains of Hindostan above the sea would place things on their present footing, and with the diminished supply of snow the glaciers would gradually retreat to their present size.

*Climate.*—In a country like that under our consideration, in

which the elevation of the surface varies from less than 1000 feet to upwards of 25,000 feet above the sea, it is manifest that we shall find every variety of climate from the intense heat of the plains of Hindostan to the rigours of an unceasing winter. In the outer part of the mountains the seasons follow the ordinary course of the neighbouring flat country. The summer rains prevail in the mountains as in the plains, only commencing somewhat earlier, that is about June. The rainy months are June, July, August, and the first half of September. A few showers fall in October, while in November, and the greater part of December, the weather is usually perfectly serene. As the cold increases the sky again becomes covered with clouds; and the winter rains, which begin about Christmas, have their maximum in February, as in the plains below.

The north-westerly winds which prevail during the day over the plains, in April and May, likewise in some degree affect the mountains; and the atmosphere during these months, and until a considerable quantity of rain has fallen, is constantly charged with a thick haze, apparently the result of minute particles of dust suspended in it, and swept up from the plains below. At most seasons of the year, however, we find that in the mountains, winds blow up the valleys during the day, that is from about 9 A.M. to 9 P.M., and down them during the corresponding hours of the night. At the debouches of the principal streams into the plains these night winds blow with great violence, particularly in the winter. They diminish in force as we ascend in the mountains, and at great elevations and in the plains of Tibet the nights are almost always perfectly calm. The diurnal winds, on the other hand, in the latter country are terrific, and in travelling there we looked forward to the afternoon, when the winds are at their height, with real dread. To show the force of these winds, I may mention that on one occasion, in measuring a line with a 100-foot tape for the purpose of getting a base for calculating the height of a mountain, both ends of the tape were successively torn off by the mere force of the wind, in the hands of my friend Mr. Winterbottom, who was measuring the line. The winds, so far as I had an opportunity of observing them in this part of Tibet, commenced in the S.E. quarter about 9 A.M., gradually shifting round with the sun to the S.W., and ending in that quarter about 9 P.M. On several occasions I have noticed the wind blowing very faintly from the N. early in the morning, and a similar phenomenon may be observed in the plains of India during the prevalence of the hot north-westerly day winds, which are succeeded by a night almost calm, with a very light air from the E. early in the morning.

The influence of the summer rains extends into the country

beyond the great snowy peaks in a very limited degree, each successive ridge stopping a portion of the moisture, as can be actually seen very distinctly.

I may also mention that, though thunderstorms are not uncommon on the southern aspect of the great peaks, they appear to be exceedingly rare among the mountains to the N. of them, or even to be quite wanting. In the plain of Tibet, however, rather violent thunderstorms, accompanied by a good deal of hail, swept over the country about the hottest time of the day for two or three days in succession, when we were travelling there in the month of September.

The power of the sun's rays at great elevations is intense in the extreme, and it forms indeed one of the chief discomforts of the stranger who visits these regions.

#### BOTANY.

I have already alluded to one of the great agents that determines the character of the vegetation with which these mountains are clothed; the influence of altitude, I need hardly say, produces effects if possible still more striking.

*Tropical Zone.*—In passing from the plains of Northern India to the Himálaya a change in the physical conditions of the country is forced upon our attention long before we reach the first ranges of hills. A belt of forest that extends along the mountains, skirting them for a breadth of 10 or 15 miles, succeeds to the perfectly open and highly cultivated districts more to the S. This forest, although strictly tropical in the character of the vast majority of the individual trees that compose it, is, from the great drought that prevails over it for the greater part of the year, far from presenting those appearances of rank and luxuriant growth that are usually associated with the idea of a tropical forest, and it is necessary to penetrate into the more sequestered ravines of the outer ranges of hills to find any such vegetation. But although this and the almost entire absence of palms greatly detracts from the beauty of the forest, we are not left without compensation in the exquisitely cut foliage of the acacias and moringa, the gracefully drooping clumps of bamboo, the saul (*Vatica*) with its tall erect trunk and brilliant dark green leaves, the semal (*Salmalia*) with its deep red cup-shaped flower and curiously buttressed stem, and the huldoe (*Nauclea*) with its magnificently drooping branches spreading from the summit of its huge columnar trunk; while from the limbs of these lords of the forest trail gigantic climbers, such as the bauhinia and robinia.

The larger trees are almost entirely restricted to the plain itself and to the more level valleys that intervene between the

outer hills and the higher ranges within, the slopes themselves being usually covered by wood of a smaller size.

As we ascend the exterior face of the mountains the tropical vegetation still prevails to a height of about 4000 feet, though even from 3000 feet a few of the forms of colder climates begin to appear; the vegetation, however, is on the whole scanty on this declivity. Far different is it when we follow the same zone of elevation into the interior of the mountains along the courses of the larger rivers, which, owing to the great depth of the valleys in which they flow, carry a tropical flora into the heart of the mountains, and thus afford opportunities not often obtained of observing the transition from one extremity of the vegetable scale to the other on a single declivity. The sheltered and confined beds of these rivers, where the two great requisites for tropical vegetation, heat and humidity, are at their maximum, often afford the finest specimens of this sort of scenery, varied as it is by an admixture of the temperate forms, which here descend to their lowest level. Thus the traveller's eye may rest on palms and acacias intermingled with pines; on oaks or maples covered with epiphytal orchideæ; while pothos and clematis, bamboos and ivy, fill up the strangely contrasted picture.

In the outer part of the mountains one of the great features of the landscape is the *Pinus longifolia*, which clothes the slopes of almost every hill, often to the exclusion of everything else, from an elevation of 3000 to 6000 feet. This pine in its general appearance greatly resembles the finer specimens of the common Scotch fir, though it is much more brilliant in its colour.

*Temperate.*—As we ascend above 4000 feet, oaks and rhododendrons gradually increase in number, and these trees, with andromeda (*Pieris*), form the great mass of the forest from 6000 to 8000 feet. At the same time species of the deciduous trees of the temperate zone are gradually introduced as we rise, and these again, with the addition of other pines, prevail in the upper regions of forest, that is from 8000 to 11,500 feet.

The peculiarities of the climate, which even in the higher parts of the mountains partakes of a certain share of the extreme heat and wet of the tropics, produce corresponding peculiarities in the features of the vegetation in these more elevated regions. We thus still find a palm (*Chamærops*) reaching an elevation of upwards of 8000 feet, a little below which it grows to a height of more than 50 feet in a locality where it is regularly covered with snow every winter. We again have one of the arborescent grasses, an arundinaria, maintaining its position as a marked and most beautiful feature of the forest region to its extreme upper limit.

Although the character of the forest in the region of the ever-green trees, viz. from 5000 to 8000 feet, is perhaps at times somewhat sombre and monotonous, from its almost exclusively consisting of oaks and rhododendrons, yet under favourable circumstances it is beautiful in the extreme. Among the trees more commonly found associated with those I have just mentioned are the cypress, ash, birch, elm, holly, hornbeam, alder, and several laurels, all of which attain a considerable size. These latter trees are more common in the sheltered ravines and on the northern slopes of the mountains; the southern slopes, which are much drier and hotter, being usually clothed with oaks and rhododendrons alone.

*Upper Forest Region.*—In the upper region the various species of trees grow more mixed together than in the lower, and, on the whole, to a larger size, so that the forest has a far finer, general appearance. Its most striking members are oaks, pines, yew, elm, horse-chesnut, walnut, several maples, pears like the English whitebeam, hazel growing to a large tree, and rhododendron. A birch, the bark of which is used by the people of the higher mountains as a substitute for paper, usually is the last tree met with.

The deodar, the distinctness of which from the cedar of Lebanon is still matter of great doubt, is only found in a state of nature in the more western part of the tract to which I am more particularly alluding, and at an elevation of from 8000 to 12,000 feet. It is, however, frequently planted by the Hindoos in the neighbourhood of their temples in all parts of the mountains, and attains a gigantic size. The deodar appears to be wanting altogether in the eastern half of the Himálaya.

Having passed the upper limit of forest, which comes to a rather sudden termination at about 11,500 feet, we enter a more open tract where trees are replaced by shrubs. There seems, however, here no very general tendency for the coppice to clothe the whole surface, as is the case with the wood in the lower regions, probably because the snow, which accumulates and lies for months together at such elevations, prevents the growth of the shrubs in certain places. The mountain-ash, rose, barberry, lilac, willow, juniper, shrubby rhododendrons, and potentillas, are the chief denizens of this belt. A few trees are still to be seen struggling on, even perhaps to a little above 12,000 feet, but they are mostly stunted and deformed.

*Alpine.*—On the mountains that project to the southward from the great snowy masses, where the precipitation of moisture is almost incessant for a great portion of the year, and the melting of the snow affords a constant supply of water, the open region above the forest is clothed with a most luxuriant herbaceous vege-

tation, which contributes very largely to the riches of the Himálayan flora, and is of no less importance to the mountain shepherd than of interest to the naturalist.

*Tibetan Plain.*—As we recede, however, in our progress to the N., behind the higher summits of the range, the country rapidly becomes more arid, and when we at last reach the Tibetan plain to which I have already alluded we find it to be little better than a desert, in which the only vegetation that shows any signs of activity is to be found along the edges of the scanty streams that water that desolate country. I estimated as I passed over this dreary waste that not one-twentieth of the surface of the plain was covered by the vegetation it supported, and on the mountains that flank it the proportion is still more unfavourable. The bushes that are seen at rare intervals hardly rise more than a foot above the surface of the soil, and afford a most meagre supply of fuel to the traveller, who is often forced to eke out his allowance of wood with the dried dung of cattle that is usually to be found about the ordinary halting-places.

The surprising effect of water in developing vegetation is as strongly shown at these elevations as in the tropical regions, where it may be considered to be the sole requisite of the husbandman. Along the borders of every little stream that we meet in Tibet is a margin of verdure the beauty and brilliancy of which is enhanced by the utter sterility of everything else in sight, and a country which at first seems almost incapable of supporting life is found in reality to abound with wild and domestic animals.

But however poor may be the flora of these regions, it is far from being without interest, as showing the last efforts of Nature to clothe the surface of the earth with organised beings. Nor can the mind of any one, however little versed in such studies, fail to be struck by the tendency which we everywhere have forced upon our notice, and nowhere more strongly than here, of the reproduction of similar types of organic life under similar physical circumstances. We thus observe that not only are the genera most abundant in the arctic regions again found in these extreme heights, but that the species, though different, still have the same general appearance and habit of growth; and we are thus carried forward to the very important consideration that the phenomenon of creation itself, that is of the introduction of new forms of life, is as much subject to laws as any of the other phenomena of organic or inorganic nature of which we have cognizance.

*Limit of Vegetation.*—At an elevation of between 17,000 and 18,000 feet vegetable life finally ceases on the mountains to the N. of the great snowy peaks of the Himálaya, though farther to the N., on the authority of my brother, Captain Henry Strachey, it appears to reach to 19,000 feet. I may here notice,



with reference to the cessation of life as we ascend in elevation, that the growth of a species appears to stop rather abruptly as we pass its natural limit, and not by a gradual degradation of size. This is probably owing to some definite condition of temperature and climate being necessary to cause the seed to germinate, without which the young plant will not be formed at all, although, if it were once formed, it might thrive well, as those individuals often do that are highest of all.

*Agriculture.*—The agriculture of the lower hills is very similar to that of the plains of Northern India. The cultivation of wheat and barley, which is carried on as far down the Ganges as Benares, the elevation of which is only about 300 feet above the sea, is extended with success to a height of 11,500 feet in the valleys that lie between the great snowy peaks and the watershed behind them. Here, however, the crop is a summer one, that is sown in May and reaped in September or October, while in the plains and outer mountains it is a winter one, sown in October and reaped in April. On the ranges to the S. of the snowy mountains the cultivation of these grains is not carried above 8000 feet, and seldom above 5000 feet.

The rain-crops of the plains, consisting of rice, of various species of panicum, and other grains peculiar to hot climates, of cotton and sugar-cane, all flourish up to elevations of about 5000 feet.

The cultivation of tea, which had been carried on by the government upon a small scale for many years, has lately been considerably augmented, and a manufactory has been established in which the tea is prepared by Chinese workmen. The quantity made is gradually increasing, and at present it all finds a ready sale on the spot at the prices usually paid for the best Chinese tea, to which it is much preferred by all persons accustomed to its taste.

In the higher parts of the mountains buckwheats and amarantus are very frequently cultivated, and these grains form an essential part of the food of the inhabitants of those regions; the former is also largely exported into Tibet, the people of which country are in a great measure dependent for their food on their Himálayan neighbours.

The cultivation in the parts of Tibet more particularly under our consideration is entirely confined to the bottom of the ravines of which mention has been made, where alone is the moisture to be found which is essential for vegetation. The grain most extensively sown is the beardless variety of barley known under the name of "*Ua*." I have procured well-formed heads of this from the fields of the town of Kyunglung on the Sutlej, at an elevation of about 14,000 feet about the sea, which were nearly ripe in the middle of the month of September, when we passed near that place. This is probably not very far from the extreme altitude at which

cereal grains are susceptible of profitable cultivation in any part of the world, though my brother has seen it carried up to 15,000 feet in the more northern parts of Ladak.

#### ZOOLOGY.

*Of Tibet.*—In conclusion, I shall very shortly notice the chief forms of animal life met with in Tibet and the more remote parts of the mountains, to which region alone I shall here confine my observations. Among these, one of the most striking, from its great abundance in the plain to the N. of the Himalaya, is the wild ass, the kyang of the Tibetans. This animal roams over the country in troops of from ten to twenty, single individuals, however, being also frequently seen, sometimes bearing on them the marks of the conflicts which appear to have been terminated by their expulsion from the herd. The yak, which, in the domestic state, forms the only breed of horned cattle in the highest part of Tibet, is also met with wild in the more secluded regions, and appears to be found even among the ranges of the Himalaya that lie along the southern edge of the plain. The wild animal is said to differ from the domestic in its colour being constantly black, in its greater size, and the more perfect symmetry of its horns.

Of the wild sheep, the *Ovis burhel* is common both in Tibet and in the higher parts of the Himalaya, while the *Ovis ammon*, which, according to Mr. Grey, is probably identical with the *Ovis montana* of North America, is of comparatively rare occurrence, and is only found in the most inaccessible country. A small antelope is also met with. A hare, a large marmot (the *arctomys*), a small animal (the *lagomys*) allied to the hare, and a mouse, are not uncommon at elevations of between 14,000 and 16,000 feet.

Of the carnivora, the ounce sometimes descends from the higher parts of Tibet, which appear to be his peculiar abode, into the northern valleys of the Himalaya, where he commits great havoc among the flocks of goats and sheep down to 11,000 feet. A lynx, a wolf, and a fox are also found in these regions.

Among birds may be mentioned the great raven, apparently the same as that of Europe, and two choughs, found in this region and the upper Himalaya; also the hoopoe, which I have seen at altitudes of 16,500 feet, and which is likewise common to the plains of India and to Europe, being a bird that appears to be quite independent of climate. A large bustard, grey goose, ducks and teal in great numbers, were seen by us in the vicinity of a long shallow lake on the plain, at an elevation of about 15,500 feet. These birds seem to breed here during the summer months, taking their flight before the winter to the more genial plains of India, where they are seen in immense flights as long as the cold weather

lasts. On the great lakes were seen herons (two species), gulls, and tern; also vultures, eagles, and hawks. A blue pigeon, dove, lark, wagtail, and a few other small birds were likewise observed, as also a partridge apparently identical with the *chicor* of the Himálaya.

The lakes, as well as the smaller streams, abound in fish, and it is a curious point for consideration how these animals can subsist in such shallow brooks, often only a foot or two in depth, which must be frozen solid with all they contain for several months together during the winter.

Two species of lizard, grasshoppers, crickets, spiders, bees, and flies were also observed, while the lower orders of the animal kingdom have their representatives in molluscs and annelids.

Of the domestic animals may be more particularly specified the sheep and goat, which are used as the ordinary means of transport in the trade between Tibet and the Himalayan provinces. The shawl-wool of Tibet is chiefly obtained from the goat, but many other animals in this country are supplied with this provision against the intense cold and the dryness of the climate.

The cross-breed between the yak of Tibet and the Indian cow is called *jubu*, or by the Tibetans *dzo*, and it, as well as the yak itself, is commonly used by the mountaineers both for riding and as a beast of burden for the more bulky articles of their commerce. The mule race is sterile *inter se*, though the female will breed with the pure stock of either species.

Tibet is also famous for a breed of ponies, remarkable for their strength and surefootedness, commonly in the north of India known by the name of *gúnt*.

#### ETHNOGRAPHY.

I am indebted to my brother, Mr. John Strachey, for the following sketch of the races of men that inhabit the British provinces of Kumáon and Garhwál, in the civil administration of which he has been employed for several years.

The fact that, in the great mountain region which extends along the whole of the N. of India, we are on the ill-defined boundary of two races, makes the investigation into the ethnographical relations of its inhabitants a matter of great difficulty and complexity.

It is not necessary for my present purpose to look beyond the two great existing divisions, Indian and Tibetan, nor to search for other remoter and less evident influences that may have been at work. Of the multitude of tribes which we find scattered through the Himálaya, some are apparently of purely Indian origin, others of Tibetan; while more frequently the two races have become mixed

together, or one of them has been modified or influenced by the other.

*Hindu Tribes.*—Between Kashmir and Kumáon the populations of the Himálaya are mainly Hindu, and the admixture of any other element that can now be detected is generally doubtful; but, as we travel eastward, the tribes of mixed race become more and more numerous, until in Eastern Nepál and Sikkim the Tibetan greatly predominate over the Hindu. An excellent summary of what is at present known regarding these Mongolian tribes, derived principally from the valuable observations of Mr. Hodgson, has been given by Dr. Latham, in his work on the ‘Varieties of Man.’ I shall here say nothing of them, and shall speak only of the inhabitants of Kumáon and Garhwál, with which districts this paper is more particularly concerned, and in which alone I have had any opportunities for personal observation.

*Khasiyas.*—Among the tribes of Kumáon and Garhwál, by far the most important is that called Khasiya. It comprises, perhaps, nine-tenths of the whole population of the country, and the same race, more or less modified by various causes, is extensively spread over the Himálayan provinces W. of Garhwál, and over the greater part of the Nepalese territories. But in the remarks which I am about to make regarding the Khasiyas, it must be understood that I am speaking only of those of the British provinces of Kumáon and Garhwál. It has been commonly, but I think rather hastily, assumed, from apparently analogous circumstances in Nepál, that these Khasiyas of Kumáon are a people of mixed Tibetan and Indian race. I do not indeed doubt that in Nepál the Khasiya race may have been modified by admixture with the Tibetan tribes, which we find gradually to predominate as we proceed eastward. Mr. Hodgson considers that the Hindu element in the Khasiyas has been engrafted within historical times upon an original Mongolian stock—a conclusion in which I am not altogether prepared to concur, even with regard to Nepál, without additional evidence. It may even, I think, be doubted whether the traces of Mongolian origin or admixture are much more definite in the people of Kumáon than in those of the plains of Northern Hindustan. Supposed resemblances of feature and form between the Khasiyas and the neighbouring Tibetan tribes have been one of the chief causes for the adoption of the opposite opinion; but I think it exceedingly doubtful whether such resemblances actually exist, while in language, religion, and customs the Khasiyas are, I believe, Hindu. The differences between them and the people of the plains are, no doubt, often very great; but they are not, it seems to me, greater than can be accounted for by the very different physical circumstances of the two countries; while, on the other hand, some of the apparent similarities between

the Khasiyas and Tibetans may equally be explained by like considerations. It is not my intention to give here any detailed account of the Khasiya inhabitants of Kumáon. In their general manners and customs, however, they assimilate to other Hindu tribes. They are a strictly agricultural people, and we find among them, in great completeness, the village communities which have been so characteristic of Hinduism from the earliest times of which we possess any record. And although their religion and social habits seem often quite repugnant to Hindu orthodoxy, still all their sentiments and prejudices are so strongly imbued with the peculiar spirit of that faith, that it is difficult for one acquainted with them to look upon them as anything but Hindu.

*Polyandry.*—The custom of polyandry, which prevails in Tibet and in some of the cis-Himálayan states, does not exist in Kumáon or in British Garhwál; but habits which might pass into such a custom are often found among the people of the wilder parts of the country. Here, where the whole of a family commonly resides under the same roof, where chastity is hardly looked upon as a virtue, and where no moral sentiments interfere, it may easily be conceived how a state of things not far removed from polyandry may arise, in which intercourse with a husband's brother is regarded not only as no great immorality, but as a smaller breach of propriety than if committed with a stranger. Whatever may have been the origin of Tibetan polyandry, we see among the Khasiyas a custom, not really distinct, which seems to have been a consequence of the general social state, and from which no necessary descent from a Tibetan stock is to be inferred. Perhaps, indeed, we see here only the exaggeration of the ancient Hindu practice of raising up issue to a childless brother, which, though reprobated by the Hindus generally, still prevails among the Khasiyas of these hills.\*

*Language.*—The language of the Khasiyas is a Hindu dialect, and, although it has not been hitherto examined with sufficient care to authorize very positive assertions regarding it, I believe

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\* Manu (chap. ix. 59, &c.) authorizes the begetting of a son on the widow or childless wife of a brother. A similar custom prevailed among the Jews (Deut. xxv. 5). It is not, I think, very clear, that Manu intended to confine this permission to Sudras, although Culluca's gloss so explains his meaning. Other circumstances may encourage, in a purely Hindu state of society, a system of lax morality approaching to polyandry. The practice, strongly reprobated by Manu (chap. iii. 51), and by all orthodox Hindus, of demanding the payment of a gratuity by the bridegroom when a daughter is given in marriage, which is universal in these mountains, tends, by checking the marriage of the younger brothers of the family, to this end. The great importance attached to having heirs to perform obsequial rites may operate in the same way. According to Manu, an uncle, having a nephew, cannot adopt a son. "If," he says (chap. ix. 182), "among several brothers of the whole blood, one have a son born, Menu pronounces them all fathers of a male child by means of that son."

there is no reason to suspect the admixture in it of any non-prácritic element.

*History.*—Historical evidence is not wanting which helps, if not to confirm the opinion that the Khasiyas are of Hindu origin, at least to show that at an exceedingly remote period these provinces were inhabited by a Hindu race, known by a name almost identical with that by which the people of the country are now distinguished. Ancient inscriptions and other historical records now existing in Kumáon and Garhwál, of which no account has hitherto been published, show that for more than a thousand years a Hindu government has existed in these provinces; that, say fifteen hundred years ago, they were ruled by Hindu kings; that the Hindu religion was then in full force there; and that they were then called Khasa, a name which may be considered identical with the Khasiya of the present day. There can be no doubt that this is the same people referred to by Manu, and in the Mhábháráta and several of the Puránas.\* These ancient authorities tell us of a race of Kshatriyas called Khasa, dwellers in mountains, who have become degraded by the neglect of religious rites; and it is a curious fact that the Khasiyas of the present day uniformly give of themselves almost the same account. They profess to be Rájputs, who have fallen from their once honourable position by the necessity of living in a country where the strict observance of their religious rites is impossible. There seems, therefore, reason for surmising that two thousand five hundred years ago, when Manu's work may have been written, these provinces were inhabited, as they are now, by Khasiyas, a race of Hindus very lax in the practice of their faith.

For those who wish to learn more of the ancient Khasas, I may refer to the essay of Wilford, published, in 1799, in the sixth volume of the 'Asiatic Researches,' on Mount Caucasus, the Coh-cas, Cas-giri, or Mountain of the Khasas. I will not follow now his wild speculations on this ancient race, nor endeavour to find in Kumáon the land of Cush, and the terrestrial paradise. The wide diffusion, over a great part of Asia, of names having the apparently common root "Khas," has often been noticed; but I shall not here do more than refer to this fact, which undoubtedly opens out a wide field for investigation.

The name Khasiya is now commonly confined to the so-called Rájputs of these districts, who form the great bulk of the population; but other castes, chiefly Brahman, exist, to which the name Khasiya may be also properly applied. *Khas* was, in ancient times, the name of the country, and its inhabitants were all Khasiya, without reference to caste. The Khasiya Brahmans are

\* Manu, chap. x. 43 *et seq.* Wilson's Vishnu Purána, pp. 195, 374. Langlois' Harivansa, p. 67, liv. 1; p. 384, liv. 3, &c.

considered very inferior to the Brahmans of the plains of India. The latter have immigrated into the hills in considerable numbers within historical times, and have monopolised for long past the most influential and lucrative positions in the country. But it is quite incorrect to attribute, as has sometimes been done, the Hinduism of the Khasiyas to the influence of these comparatively modern intruders.

*Mixed Races.*—Besides the Khasiya aborigines, if we may so call them, and the Hindu immigrants from the plains, tribes of undoubted Tibetan origin, and others of mixed Tibetan and Hindu race, are found in the northern parts of these provinces. The most important of these is generally known as Bhótiya. “*Bód*,” the Tibetan name for Tibet, corrupted by the people of India into *Bhot*, has given rise to the designation *Bhótiya* for the bordering tribes between the two countries. Here I shall refer only to those of Kumáon, and it will give a sufficiently correct idea of the limits of the Bhótiya tract in this province if we consider that it is bounded on the N. by the watershed of the Himálaya, and on the S. by a line passing a little to the N. of the great peaks of the chain. The Bhótiya villages are all situated in the valleys between the great spurs which run down from the watershed ridge, at an elevation above the sea varying from 7000 to 12,000 feet. They are occupied only during the hot months of the year, the whole population migrating every winter into the milder climate S. of the great peaks of the chain. One poor and uncertain crop, consisting chiefly of barley and buckwheat, is obtained each year at the Bhótiya villages; but the Bhótiyas are not an agricultural people, and they look almost entirely for their support to the carrying trade between Tibet and the cis-Himálayan provinces, of which their position at the foot of the passes across the snowy range gives them a monopoly. A valuable general account of the Bhótiyas, though not always a strictly accurate one, has been given by Mr. Traill in the seventeenth volume of the ‘*Asiatic Researches*.’

The language of these tribes is alone sufficient to prove for them a Tibetan origin, and the unmistakable peculiarities of feature that belong to the Tibetan family are as strongly marked in the Bhótiyas as in the people of the adjacent parts of Tibet itself. It is unnecessary to speak of the subdivisions of the Bhótiya tribes, nor need I mention more particularly the mixed races which are found on the boundary-line between the Bhótiyas and the Khasiyas. All these, as well as the Bhótiyas themselves, affect to consider themselves Hindu; and although their claims to such honour are seldom conceded by orthodox members of that faith, the distinctive marks seem gradually to be disappearing, and the time is, perhaps, not very far distant when the descent of

the Bhótiyas from a cow-killing race will no longer be remembered. Their language, too, seems to be gradually becoming extinct; and in Juhár, the most important of the Bhótiya valleys, it has died out in the memory of the present generation.

The only other tribe that seems to demand mention is the Ráji, which it has sometimes been thought may be a remnant of the aboriginal population of these provinces. Our information regarding this tribe is very incomplete; and as there are probably not more than thirty or forty families of it living in Kumáon, it is not easy to obtain information regarding it. They are said to be more numerous in the Nepalese territories E. of Kumáon, and it is not impossible that they will prove to be a tribe of Tibetan origin, allied to some of the tribes of Nepál, of which Mr. Hodgson has given an account. The Rájis are not Hindu, either in language or in manners. They have a dialect of their own, clearly allied to the Tibetan. They are not agriculturists; they consider it unlucky to cultivate the soil, and have no permanent dwellings. They support themselves chiefly by hunting and fishing, and partly by bartering various wooden implements of furniture and husbandry for the grain of their more civilized neighbours. They are a timid and inoffensive race, avoiding as much as possible all contact with the Hindu population by living in forests in the most sequestered spots. Their religious and social customs are peculiar, and differ considerably from those of the Khasiyas, or of any other tribe found in Kumáon.

*Tibet.*—Of the inhabitants of the parts of Tibet adjacent to the British frontier I shall here give no account, and I only allude to their country for the sake of mentioning a mistake that is usually made in its name. It was called by Moorcroft "Undes," *Wool Country*, and, on the great authority of Dr. Wilson, it has been said to be "Hiundes," *Snow Country*; but there can be no doubt that the real name is "Hundes," *the Country of Huns*. From ancient inscriptions found in Garhwál, of which I intend to give an account hereafter, it is proved that the country in question was known under the name of "Huna" probably more than 1000 years ago, and the race of Hunas often mentioned in the Puránas undoubtedly refers to the people of the same country. I am not aware that this apparent corroboration of the views of ethnologists as to the origin of the Huns in the countries on the northern border of the Himálaya has been hitherto noticed.

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VIII.—*Plan for a direct Communication between the great Centres of the Populations of Europe and Asia.* By ASA WHITNEY, Esq., of New York. Communicated by the PRESIDENT.

[Read June 9, 1851.]

MR. PRESIDENT,—Permit me to say, that I feel myself deeply indebted for the honour which you have been pleased to confer on me by this opportunity of bringing before you my project to construct a means of rapid communication between the Pacific and Atlantic Oceans—a subject to which I have devoted the best part of my life, and one in which I feel that the entire human family is deeply interested.

A plan for making a railway may not perhaps be considered as within the sphere of your Society, but this is intended to be a great highway for the world; and to show what are its objects, as well as the results we aim at in its accomplishment, we must consider the geographical position of the principal parts of the habitable globe, as well as examine into the condition of its population; and we must go back a little into the past, where we see that commerce with civilization has for ages been travelling westward; that the commerce with Asia has built up all the states and empires of the past, all of which, in their turn, have sunk into decay; that commerce with civilization has reached the extreme west of Europe, which, with this small island and the United States of America, now controls the commercial world. Is it to remain here, or will its march be still westward until it shall have encircled the globe?

First, we see that civilization and the mechanical arts have attained their highest point at the extreme west of Europe, where we behold an excess of population, so great, that labour no longer receives a reward adequate to supply the needful wants and comforts of life, and necessity creates and induces immorality, vice, and crime to an alarming extent; thus rendering such a population immensely burdensome.

Secondly, almost directly opposite, in China (the highest point of civilization on that side of the globe) are the same difficulties, augmented by the fact, that the natives are not a great maritime people, and have no means of conveying their surplus where nature has provided sufficient space to supply their wants; hence they are actually forced to destroy the life of some in order to preserve that of others.

It appears to me that it should be the first grand object with the statesman and the philanthropist to carry into execution, if possible, some plan by which the great and constantly increasing difficulties, so manifest at these two points of extreme civilization, could be ameliorated. I believe that it can be done. With

such an object in view I have proposed the construction of this great highway.

On my map I have made three grand divisions of the earth,—Europe and Africa as the first, separated by the Atlantic from the second or the American continent, between which and all eastern Asia, or the third division, is the Pacific Ocean. Hence it will be seen that the American continent, by Nature's decree in the formation of these two great oceans, appears to be the great geographical, commercial, and political centre of the world; and it is remarkable that almost the entire population, as well as the greater part of the habitable earth, is on this belt, to the north of the tropics. We find that almost the whole of the North American continent, excepting Oregon, slopes to the Atlantic directly fronting western Europe, with an unoccupied area, sufficient, during ages to come, for all the surplus populations of Europe, who are now wending their way thither by hundreds of thousands annually; and while Europe has no tropical productions, the American continent presents all the soils and climates of the earth, with all their varieties of products, excepting those peculiar to the commerce of Asia with Europe. Now, the construction of this road would open to settlement and production the most extensive and most important part of this American continent; it would give homes and employment to the surplus population of all Europe, and furnish to every man the means of supplying his own natural wants, with a surplus, for which this road would be the means of cheap transport, to supply the wants of Europe and exchange for mechanical productions. It appears that Nature has intended North America for the uses of the surplus population of Europe. It is more easy of access, and exchanges can be made there at much less cost for transport, than any other part of the globe, and in a climate suited to natives of the north of Europe. Besides which, when we look at the Pacific side, we find that Nature's division—a chain of mountains—ranges close to the ocean all the way from Cape Horn to Upper California, so that the space for population is small on the western side, and Nature has not been pleased to place any important islands near that coast. As we go northwards to Oregon, we find a climate as genial as that of England, a soil fertile, and capable of sustaining a population nearly as large as that of all Europe, and with fisheries extending to Tartary, which might employ millions of men, having China and all Asia for a market.

We look from this point over the Pacific, 5000 miles, to China, with her hundreds of millions of souls, and a surplus population beyond the ability of their land to sustain. They have already extended themselves as far north as the soil and climate will yield a reward to man's toil; but they have not the means of reaching the islands, now occupied chiefly by the pirate or the cannibal,

which Nature seems to have intended for the Chinese, and not for Europe or the cannibal. They can look forward to no hope of any amelioration of their condition, unless such as may come from us.

The proposed road is intended to furnish that hope, by making a cheap and rapid means of intercourse between them and Europe across the American continent, which would indirectly offer soon the means of removing their surplus population to Borneo, New Guinea, Australia, &c., and augment on that side of the world the amount of the products which form their commerce with Europe; while the facilities which it will have rendered to settlement and production will increase the ability and desires of both Europe and America to make exchanges with them, and supply each other's natural wants and comforts, as well as improve their physical and moral condition. Can these great objects be accomplished by any other way or means than those which I have to propose?

The commerce of Europe with Asia remains nearly stationary, and cannot be increased unless some great change can be effected in the condition of the people, so as to give to each side the means to consume more of the other's products and commodities. New routes for intercourse, and new means for transport, have been proposed with a view to effect this most desirable object. Suez has been named as one of these routes; but Mr. Robert Stephenson, than whom there is no better authority, has been over that route, and he agrees with me, that, were Suez itself swept away, the great commerce of Europe with Asia would still go round the Cape of Good Hope, on account of the dangerous navigation of the Mediterranean and Red Sea, and on account of the bad climate. The Isthmus of Central America has been looked to during ages for a route between Europe and Asia; but here the difficulties of climate are greater than at Suez; the navigation is dangerous and difficult, particularly for sailing vessels, which must be used, as the distance from London to China by this route would be about five times that from England to New York, and little or no merchandise could sustain a charge, such as even a screw propeller would be obliged to demand for transport; besides which the distance, as compared with that by the Cape of Good Hope, is greatly against this route.

From London to Canton the exact measurement over a globe, *viâ* Panama, is 1560 miles more than by the Cape of Good Hope; but the voyages by sailing vessels have made the difference 2430 miles in favour of the Cape route. Between London and Singapore the exact measured difference would be 3600 miles against Panama. Between London and Sydney the Panama route would be 390 miles less than that by Cape Horn, and 180 miles less than by the Cape of Good Hope, but sailing vessels

have made the difference greatly against the former. To Western Australia the Cape of Good Hope route would be 3360 miles actual measure less than by Panama, and the sailing difference is still greater. This is a subject on which anybody may be satisfied who will take the trouble to measure a globe; comment is here unnecessary, because these are geographical facts, and arguments cannot change them. But were there an open strait at Panama that would allow sailing vessels to pass through it as easily as round the Cape of Good Hope, what would be the gain? Commerce could not be increased, because the condition of the populations of both Europe and Asia would remain precisely as they now are; no new and inaccessible country could be opened to settlement and production, and no new means created to increase and sustain commerce. All the different parts and people of the world would remain precisely as before.

We see, Mr. President, in this remarkable geographical arrangement which the American continent presents to the world, as well in soils, climates, and products, as in population and vacant space for occupation and support, so equal a division, that it would seem as if Nature has intended it as the watershed to divide the commerce and intercourse of the world. And it must be clear that these two sides cannot make exchanges with each other to any considerable extent, because their soils and climates are the same, and after a little while their products will also be the same; nor can the western side, owing to greater cost for transport, compete with the eastern side in supplying and exchanging with Europe.

In looking now at the geographical and commercial position of this western slope of the American continent, we find that Oregon not only commands the entire slope, but that it also commands all the islands and all Eastern Asia, with the best possible navigation to and from the islands and the Asiatic coast.

Going to the east "the trades" would be taken: while returning west, the northern and shortest route would be made with "the variables," or westerly winds, having thus a fair wind both ways.

As compared with Panama, the actual measurement of the globe will show a great difference in favour of a route by Oregon. We will first take the Marquesas, the nearest of the islands to Panama, where we find a difference in favour of Oregon, and the difference increases with other parts until our measuring-line reaches across the entire American continent and half way to Europe, while a sailing-vessel bound from any of these islands or points to Panama would, owing to the trade winds, be forced to run north towards Oregon before directing her course for Panama. Now, with this commanding position, with all the natural ele-

ments for wealth, power, and greatness, and with the recent developments in California, what are we to expect, but that the energy, the enterprise, capital, and labour of both Europe and the Atlantic side will be drawn there, and be the means of pushing forward into power a nation possessing the best of our energy, our skill, and our genius?

Remote as they will be from us, with a heavy cost for transport, is it reasonable to suppose that their intercourse and exchanges with us will not be limited to and governed by actual interest? And with the immense commerce at their command with the one half of all the world, of which they will be the sole carriers, may we not expect that they will successfully establish the mechanical arts, so as to supply most of their own wants, and make their own exchanges of the various products and commodities of their various parallels and climates to greater advantage than with Europe? And the commerce of Europe with Asia, which England now controls, will it not, with her people, capital, and enterprise, be gradually transferred to that point?

These are no new views, nor are they based upon the recent developments in California; they were matured and placed before the world long before the boundary question of Oregon became a subject of agitation between England and the United States. They were based upon the geographical position of the country, and upon its natural resources, with the certainty that so soon as security could be given to persons and property, the American whale fishery would be transferred there, when small vessels might be built and fitted out to make three and four cruises in a year, now requiring from the Atlantic side two to four years; that fishery then employed 20,000 of the very best seamen, who, with their families, would make 100,000 souls, to which might be added almost immediately 300,000 more to till the earth and commence a commerce with that coast, with the islands, and with Asia. Here would have been a foundation for a great nation, such as the world perhaps has not known; but the events in California are hastening more rapidly in another form, though not so healthily, the results which I had foreseen in the distance; and if my views and positions are correct, are we not sending away our capital, our enterprise, and our labour to build up a powerful separate nation, in whose prosperity, greatness, and power we can participate only to a limited extent, unless we can get some direct, cheap, and rapid communication with them, so that our interests may be united, and each participate in the advantages of local position with the prosperity, power, and glory of the other? The road, which I propose to make, will, unless I am very greatly mistaken, secure to us for ever these grand results.

But we know that a railway cannot be made without means,

and for a road of 2030 miles through an entire wilderness, a very large amount of available means would be required ; an amount so great that no capitalist would invest in such an enterprise, because he could have no reasonable hope for any return ; and no government, certainly not that of the United States, could undertake such a work with any hope of success. Even were it completed, and its earnings looked to for the annual interest on its cost, that would be fallacious, because the charges on transport for that object would exclude traffic, and the objects aimed at by the work could not be accomplished. To meet all these great difficulties, I have recommended a new plan for this great work, one which, while it costs the nation nothing, will, *in creating itself*, add as much actual wealth to the world as the road may cost for its construction, give to the world a free highway, and in doing so, furnish employment, homes, and plenty to millions, who otherwise would be destitute ; besides which it will open to usefulness the now uncultivated wilderness.

I propose to take the wilderness lands as my basis of means. The Bill now pending before the American Congress, and which has received the unanimous sanction of several of its committees, as well as the almost unanimous sanction of 21 State Legislatures, and of the people of the United States generally, proposes to set apart and sell to me, as an individual, 60 miles in width of the public domain, extending from Lake Michigan to the Pacific Ocean, in all about 78,000,000 of acres,\* for which, upon completion, I agree to pay into the public Treasury 10 cents. per acre. The first 800 miles of the line include lands that are all of the very best quality for agricultural purposes, easy of settlement, and ready for a crop, being mostly prairie. On this extent is based the means for this work, and, in order to secure it to the nation, this space of 800 miles of good land is to be divided into sections of 10 miles by 60 each, and when each section of 10 miles of road shall have been completed, then I shall be allowed to sell one-half of this section of land, say 5 miles by 60, or 192,000 acres, to reimburse my outlay for the 10 miles of road ; and should it sell for more than that sum, the excess will be my profit. The other half, 5 miles by 60, will remain unsold, and be held as a fund to be used in carrying the line beyond this 800 miles of good land, where the sale of the whole section of 10 miles may not prove sufficient to reimburse the outlay on the 10 miles of road made through it. In this manner the 800 miles of good land at the first end of the line is made to furnish means for 1600 miles of the road ; the other 430 miles is provided for from the 100 miles of good land on the Pacific side, and from the

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\* New Zealand contains about 62,000,000 acres.

1100 miles intermediate, some of which is good; and a large portion would be made available for settlement in consequence of the road passing through it. After the work shall have been completed, and shall be in successful operation, all the surplus lands would be my reward for the work; but though the title to the road would vest in myself and my heirs or assignees, still Congress would hold the power to regulate the charges for transport, and keep them at an amount required for the expenses of operation and repairs, thus making it a *free* road.

The tide of emigration to the United States is such, and the settlement in the immediate neighbourhood of the proposed route is so great, that there can be no doubt, with the facilities which the road would render to settlement, besides the advantages of a cheap means of transport to market, that there would be a demand for the lands on its line to an amount quite equal to any sum that could be profitably employed in making it. It would not, however, be necessary to confine its progress to the amount of actual sales of the lands, because the lands being the basis relied on, capital would look to them, and not to the road, for a return or for interest; and as the sale under any circumstances would far more than meet the annual interest, and as the security would be daily augmented from the enhanced value which the operation and advancement of the road, as well as from partial settlement, would give to the unsold lands, the longer they remain unsold the greater would be the return for the investment on them. With 19,000 families, or 95,000 souls, per annum, and allowing each family to purchase 160 acres of land at the usual price, I could complete this great work in 15 years; yet this is only about one-fourth of the annual emigration from Europe to the United States! The settlements in Wisconsin, between Lake Michigan and the Mississippi River, directly in the neighbourhood of the proposed route, have exceeded 100,000 souls per annum for several years; in Iowa, W. of the Mississippi, it has exceeded 50,000 per annum; and in Wisconsin, N. of the proposed line, the settlements of last year were estimated at more than 50,000 souls, and all this without any of the facilities and stimulants which the formation of such a road would create.

I make this explanation in order that the subject may be fully understood, and not with a view to procure capital or to solicit investment, because it is a plan which must provide for itself; still, when under way, the lands will afford the safest and most profitable investment ever offered to the public, being constantly increased in value, and subject to no changes from state legislation or state embarrassments.

Capitalists and practical business men, here and in the United States, have full confidence in the plan; and the necessary amount

of capital for its commencement is at the command of the Bill, so soon as it may be enacted into a law by Congress.

Mr. President, before I embarked in this great enterprise I counted well the cost. It had been my lot to have been extensively and actively engaged in commercial pursuits with the different parts of the world, which gave me a knowledge of mankind sufficient to understand what I was about to take upon myself, and to comprehend what I might expect to encounter in toils and trials necessary to satisfy public opinion, and to carry out the work. And the first trial was in satisfying my own mind before I could persuade the public to take an interest in it: those who esteem a reputation, and regard public opinion, can appreciate this trial.

To make this preparation I spent two years in Asia, where I collected statistics of population, of commerce, of products, and resources of China and the islands particularly, but of all Asia generally. I studied their manners, habits, and wants, and examined the condition of the people, so as to ascertain for myself the probable results which the successful opening of this great highway might influence.

From the geographical formation of the North American continent I was assured of a feasible route; but in order to be fully satisfied on this point, as well as to be sure that my basis for means was solid and available, that materials with facilities for carrying on such a work, as well as for the settlement through the wilderness, did exist, and that the streams could be safely bridged, so as to give an uninterrupted intercourse from ocean to ocean without transshipment, in the summer of 1845, eight months after my return from Asia, with a company in all of seven, I traversed a large distance of the country through which the proposed road would run. I examined the streams (the Missouri for 1500 miles), the Mississippi, and others, to ascertain the points at which they can be bridged. I was on the Missouri in a canoe for 27 days. The result was satisfactory. I found that for the route which I had proposed *all* the streams could be bridged; I found the country beautiful, and for the plan I had laid down well adapted to settlement: though mostly prairie, there is an abundance of coal, and by starting at the point which I have proposed, there will be materials and facilities for the work, as well as for settlement.

My own personal examinations, as far as the South Pass, prove that the ascent is gradual, and not great; thence to the Pacific the streams which flow into the Columbia will be followed. The elevations all through have been taken at three different times, and show the route to be feasible. This exploration was one of severe toil and hardship, and I was often without food for days, and 85 days without being under a roof.



The route is remarkable, as will be seen by the geographical formation of the country. Here, at what is called "the South Pass" (an open plain of 30 miles in width), the waters running into the Atlantic on the E. and those which flow into the Pacific on the W., are separated. To reach this point from the E. the ascent is so gradual as to be scarcely perceptible. From the proposed starting point of the road on Lake Michigan the distance is about 1200 miles, and the entire elevation to overcome in the whole distance is about 6000 feet. On the Pacific side the country is more mountainous, but there are no insurmountable difficulties in following down the streams, which are without any great rapids; and it is remarkable that there is no feasible route S. of this. From the 32nd to the 42nd parallel there is no route by which the mountains can be avoided, and the great arid plains would also present insuperable obstacles.

From the 98th meridian, westward, the earth is not productive, except by irrigation, and there are three high mountain-ranges traversing this parallel from N. to S. Farther northward, however, there is a practicable route over British territory, to which line the attention of the public has been directed by my friend Major Carmichael Smyth and others.

The route which I have proposed to take is not only the sole feasible one on the United States side, but the only one *in the same* where the lands can be made available, or capable of settlement to any great extent, and the only route where all the streams can be bridged; besides which, on a great circle of the globe, it is the shortest route between any of the Atlantic cities and the Pacific; while the proposed terminus at Puget Sound is in the only harbour and climate suitable for such a commerce.

The Halifax, Quebec, and Montreal roads will run on to join Michigan, to be connected with it S. of the lakes; besides, all Canada would have free access to it by the lakes, and we should have the shortest route (*except on the English territory*) across the American continent between Europe and Asia.

As compared with Central America the difference is immense, as will be seen by measurement on the globe, the actual difference being 3840 miles; and as compared with the Cape of Good Hope, it is 2100 miles; but, as voyages are now made, the difference would be much greater.

The saving in time, owing to better navigation and the great railway distance across the American continent, would be immense. The land journey between England and China could be made (allowing 30 miles per hour for railway and time for coaling, &c.) in 29½ days, and by sea with sailing vessels in 58:—now requiring an average of 120 days. From Halifax or New York to China the land-journey might be made in 19½ days, and the

voyage in 38 days, now requiring 120, and at a less cost for transport than by the present sea-voyage, besides having the advantages of a climate in which all commodities of commerce would be secure from damage or destruction.

It would require too much time to go into detail here, but I can show that, taking the actual as well as the estimated charge, for a large amount, and regular traffic on your railways costing 32,000*l.* per mile, and estimating freights by ships as it is charged by measurement of 40 cubic feet to the ton, and by railways at the actual weight, the commerce of Europe with Asia can be carried over this railway, if made, as proposed, a *free road*, so as to cause an immense saving in cost, interest, &c., as well as in the capital employed. But suppose that I am in error in this (which, as I have devoted so much time to, and so closely examined the whole subject, besides having consulted so many authorities, I cannot admit); and suppose that I succeed in making this railway as I have proposed; or suppose I complete only 500, 700, or 1000 miles of it—which I can do only as I effect a settlement of the country—would not even this bring the wilderness into use and occupation by civilised man? Would it not give employment, homes, and plenty to millions now destitute? Would it not give to them a cheap means of transport for their products to a market, and to exchange for the mechanical products of Europe? Would not this benefit their moral and physical condition? Would it not be a means of civilising the Indians, if that be possible? Would it not benefit Europe? And would it not benefit the world?

The American Congress will doubtless pass my Bill into a Law at the early part of the coming session, but the rapid settlement which is being made on the lands at the beginning of the route is, I fear, likely to render the execution of the plan impossible, because there can be no adequate substitute for these lands, or for the facilities afforded only at the starting point. Then, Mr. President, there can be no hope for this great work, except on your side, on the British territory—where the route is feasible, and where, though there would be great difficulties in carrying my plan into execution, I believe it can be successfully done. Should it fail on the American side, it will then be my desire to see it carried out on your side. It is a work for the world, and as such it is my desire and cherished hope to see it accomplished. I claim no patent for my views, opinions, or suggestions; but I have made a direct proposition to my own country and to the world, and have laboured hard to show its importance: all I ask is the use of the wilderness land on our side or on your side, and I am ready to redeem the pledge that I have given to the world.

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IX.—*Survey made for a Canal, through the River Sapoa, to the Port of Salinas or Bolaños, in, Costa Rica.* By MAGISTER ANDREAS OERSTED, of Copenhagen. Presented by Mr. G. FYLER.

[Read June 9, 1851.]

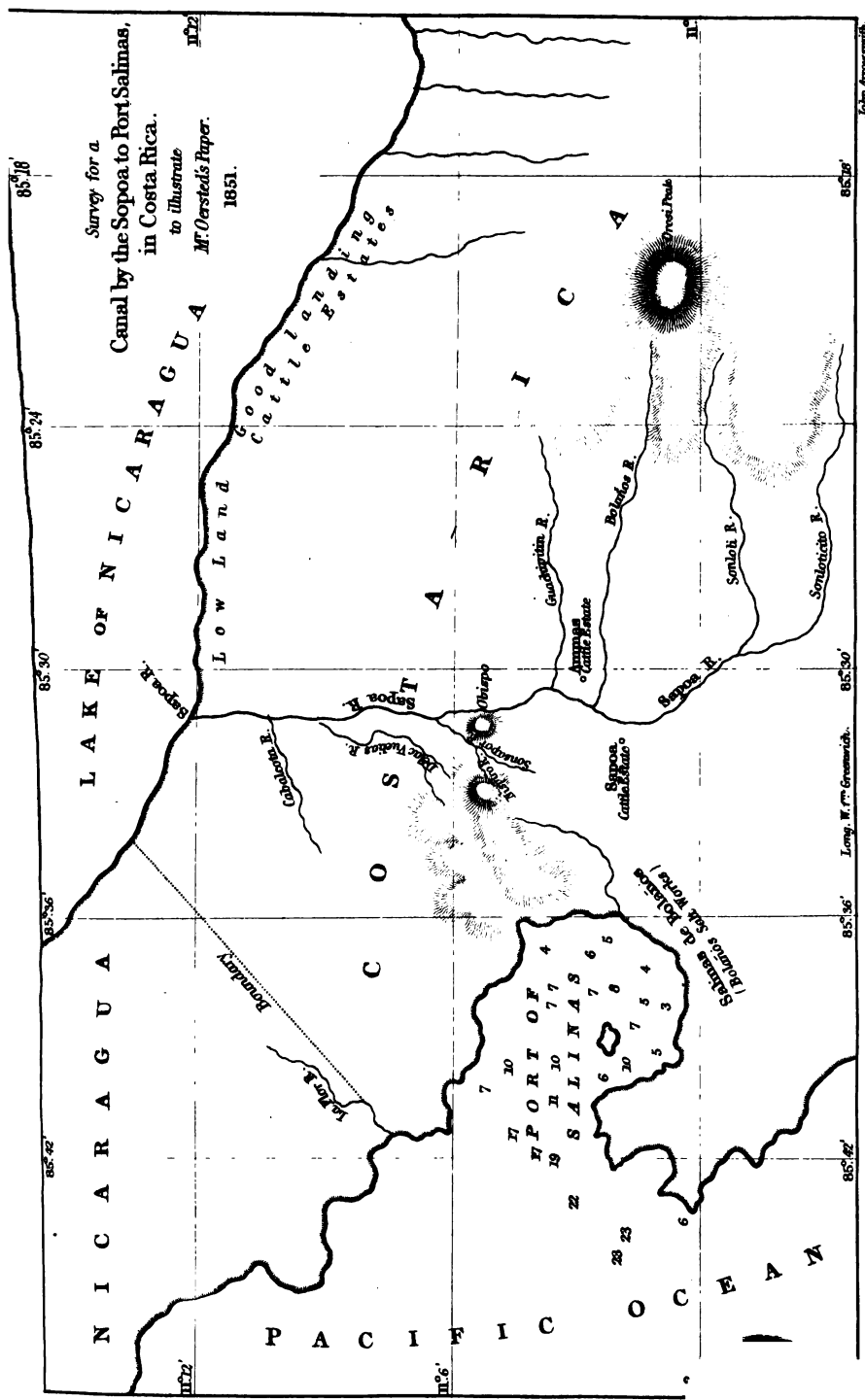
DR. FRANCISCO OREAMUNO having mentioned to me a spot in the department of Guanacaste, which he thought would be the most favourable for cutting a canal to unite the Lake of Nicaragua with the Pacific, I—having to make a journey to that department for the purpose of continuing my researches in natural history, and knowing that the Government of this State takes a great interest in every project likely to prove advantageous to the country—desired to make, in company with Dr. F. Gutierrez, all the investigations of which the short space of time and the want of necessary instruments would admit. Thus it is that I take the liberty of presenting to your Excellency this short account, together with the topographical sketch-map of that department.

The formation of a canal in that part is quite possible; on one side a long passage in the bed of the river Sapoa, and on the other the beautiful low level country which extends from the Pacific along the salt lagoons of Bolaños into that river, present undoubted facilities. The following is the description of these places:—

*The river Sapoa, from its entrance in the Lake of Nicaragua, to the Creek of Sonsapor.*

The Sapoa is one of the largest rivers discharging its waters into the Lake of Nicaragua. At its mouth it has a width of 200 yards, with a depth of 2 to 3, and it is never choked up with sand-banks. At a quarter of a league's distance from its mouth it has a depth of 10 yards, diminishing gradually; and it is navigable for the largest canoes up to within three-quarters of a league from its mouth. Higher up, although navigable, there are rapids. We embarked at a quarter of a league from the mouth, and proceeded up to the creek of Cabalcota, where there is a small rapid close to Peña blanca (White rock). This rapid is formed by two arms into which the river is there divided. One of these, with a little cost, might be made navigable for all sorts of canoes. Near Cabalcota the width of the river is 25 yards, gradually diminishing in depth up to the mouth of the Sonsapor. In this latter part, from Cabalcota to Sonsapor, which is about  $1\frac{1}{2}$  leagues distance, the navigation is rendered very difficult, if not impossible, by numerous rocks and rapids. The course of the river from its mouth to this place is N. and S.





Survey for a  
Canal by the Sopoia to Port Salinas,  
in Costa Rica.  
to illustrate  
M. Orsted's Paper.  
1851.

John Murray.

Long. W. of Greenwich. 85° 56' 85° 50' 85° 44' 85° 38'

Published for the Journal of the Royal Geographical Society, by John Murray, Albemarle St. London. 1851.

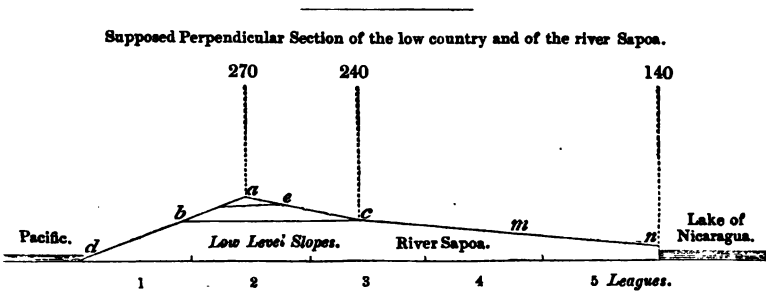


*Description of the low level country between the Pacific and the river Sapoa.*

This low level is nothing more than a continuation of the low coast formed by the salt lagoons of Bolaños towards the N.E. ; this coast rises very slowly for 6600 yards from the sea, where you reach the highest point, which point does not appear to be higher than 270 feet. This inconsiderable height has a length of 1200 yards, whence it slowly descends towards the river Sapoa, forming thus the separation between the waters which run into the Pacific and those which flow to the Sapoa. The waters to the Pacific flow only in the rainy season, and those to the Sapoa are formed by two creeks, the Nispiro and Sonsapor, which unite and flow into the Sapoa.

This low country has on both sides high ridges of land, but does not present any sudden rises nor any other impediment except a few large stones. Measuring exactly the distance from the sea to the road, which goes from the mouth of the Sapoa near that river and passes by the declivity "Del Obispo," there is a distance of 12,600 yards ; so that the total extent of the low country does not much exceed 2 Spanish leagues.

*Respecting the cutting a Canal in these places.*



The communication of the Lake of Nicaragua with the Pacific at the points thus projected consists in cutting a canal of  $2\frac{1}{2}$  leagues along the course of the river Sapoa, and a canal through the low level or sloping country, which is  $2\frac{1}{2}$  leagues in extent. The river Sapoa for a distance of 1 league is already navigable, the remaining league and three-quarters offer no difficulty to cutting a canal, as a small excavation of the same river and a few locks will be sufficient. In order to cut a canal through the sloping country, it will be necessary to bring it to the same level as the river Sapoa at the mouth of the creek of Sonsapor, a distance of 6700 yards, to the eastern side of the elevation *cb*. For this

purpose it would be necessary to make a small excavation of 5000 yards in length from *c* to *e*, and another deeper one of 1200 yards from *e* to *b*. The other side of the low level (slope), as far as the Pacific, may be cut through by a small excavation and a few locks.

From the foregoing it is presumed that the plan of conducting the waters of the lagoon or lake into the Pacific would not be entertained at all, as this, owing to the nature of the soil, would be very difficult, if not impossible. Nor would it be at all required, as the river Sapoa contains quite water enough for the canal on one side in one direction, and the creeks of Nispiro and Sonsapor, added to the waters which irrigate the descent to the Pacific, would furnish quite sufficient in the other. It may be well to notice here that all this country has a firm soil, composed of porphyry, with the exception of that part of the descent next to the Pacific, which consists of sandy clayey soil. The porphyry has the advantage for the excavation, that in many parts it is composed of mounds, which break very easily.

Thus it appears that the whole canal would consist of—

River Sapoa :—

1 league of the river Sapoa, navigable (*n, m*).

1½ leagues of same river, with a small excavation (*m, c*).

Low, level, sloping Country :—

7,500 yards of small excavation (*c, e*).

1,200 do. of rather deeper do. (*e, b*).

6,000 do. of small do. (*c, d*).

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#### OBSERVATIONS.

*Comparison between this spot and that examined and proposed by Mr. Bayley, for making a Canal.*

The value of things is relative. In order to learn the value of this point it is necessary to compare it with other points already projected and explored. If there exists a better spot, the value of this one, notwithstanding the various advantages it may possess, is less than the other; but if there be no other point as good, then the one here advocated should be preferred. It is for this reason that cutting a canal in this spot appeared to me difficult before I knew the observations which Mr. Bayley had made at another point; but since I have seen them, and compared the two, it appears to me that the one here projected offers many more facilities.

The spot proposed by Mr. Bayley extends from the mouth of the river San Juan del Sud, on the Pacific, in a direct line as far as the Lake of Nicaragua, making a distance of a little more than





1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is essential for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It highlights the need for a systematic approach to data collection and the importance of using reliable sources of information.

3. The third part of the document describes the process of identifying and measuring the key performance indicators (KPIs) that are most relevant to the organization's goals. It stresses the importance of setting clear, measurable targets and regularly monitoring progress against these targets.

4. The fourth part of the document discusses the challenges and limitations of data analysis. It notes that while data analysis can provide valuable insights, it is not a perfect science and there are many factors that can affect the accuracy and reliability of the results.

5. The fifth part of the document provides a summary of the key findings and conclusions of the study. It reiterates the importance of data analysis in decision-making and offers recommendations for how the organization can improve its data collection and analysis processes.





leagues. At this point there is a ridge of high mountains, which would require a tunnel of  $\frac{1}{4}$  of a league, and a very deep excavation of more than  $\frac{2}{3}$  of a league, and for the remainder a wall excavation. Thus, while it appears that there is hardly any difference in the extent of both canals, the plan here proposed by me possesses two advantages, viz.:—1st. *That one league is ready navigable naturally;* 2nd. *That no tunnel will be necessary.*

*Last Observation.*

It should be borne in mind that all the levels in a perpendicular, as well as a horizontal direction (with the exception of the level of the sloping ground), have been taken approximately, that on this account no very exact calculation can be made of the expense that would be incurred in making a canal. I think, however, that this survey is sufficient to prove that a canal can be made here with more ease and with less expense than in any other place as yet explored. The object of this statement can be no other than to encourage the supreme Government to have the point examined by parties who may possess sufficient knowledge for making a minute investigation and an exact calculation, and thus give an impulse towards realizing an idea which, more than any other, is calculated to promote the welfare and grandeur of this country. The great value which the realization of it would have for the commerce of the whole world is so clear, that the carrying into effect such an undertaking has been for many years a great desideratum of all nations. These are the slight observations which I have been enabled to make in the short time during which I remained in the department of Guanacaste. The narrative which I give of them is perhaps not so exact as it should be, owing to the difficulty I feel in expressing my ideas in a foreign tongue. Nevertheless, if the President should consider them worthy of his attention and of some utility to the country, it will be a reward sufficient for me and I shall be satisfied; requesting only that the defects which my account contains may be excused.

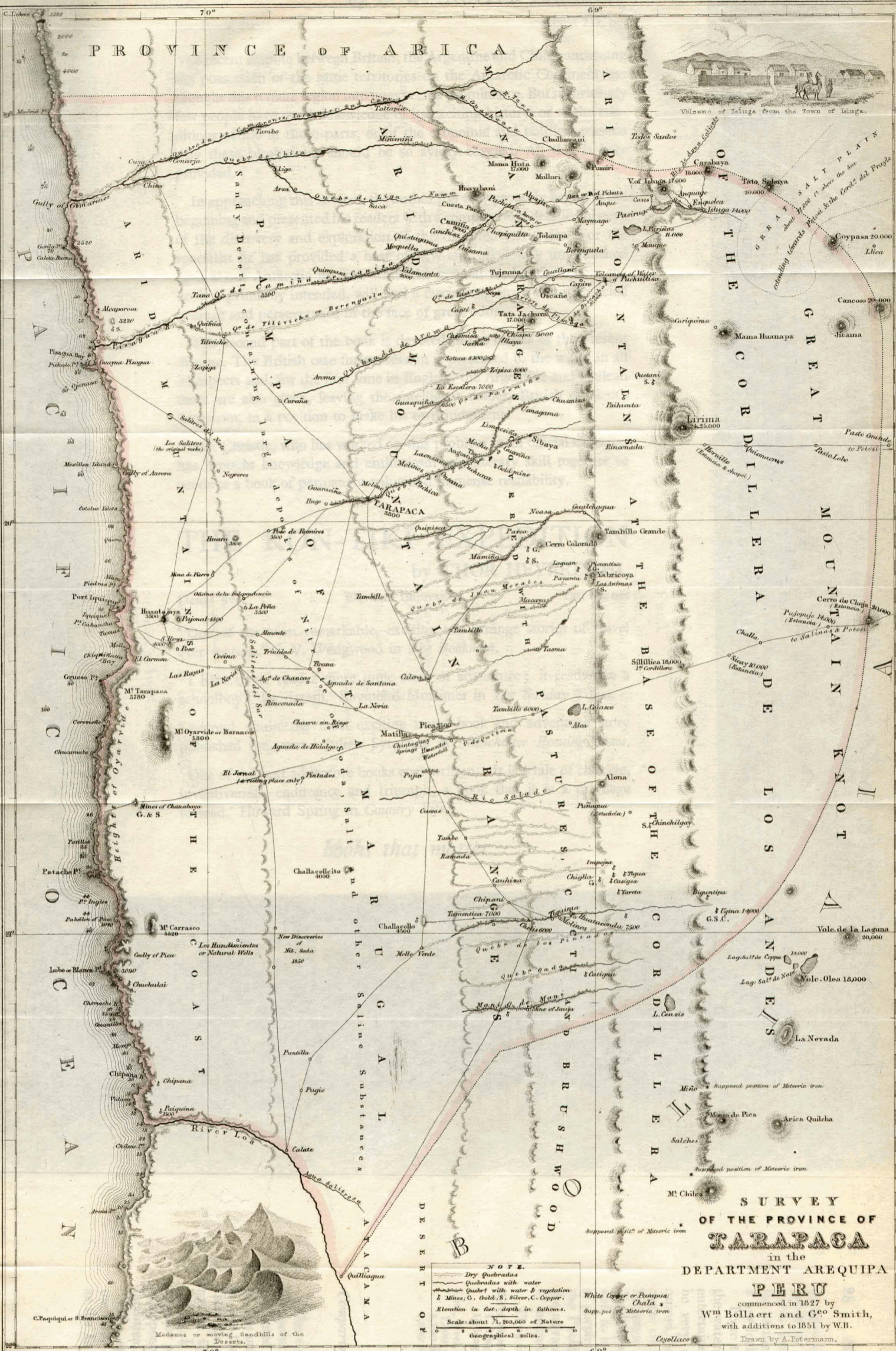
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X.—*Observations on the Geography of Southern Peru, including Survey of the Province of Tarapaca, and Route to Chile by the coast of the Desert of Atacama.* By W. BOLLAERT, F.R.G.S

[Read April 28, 1851.]

A RESIDENCE of some years in Lower Peru, in the province of Tarapaca, department of Arequipa, commencing in 1826, during which I was engaged in mining operations at the celebrated silver-

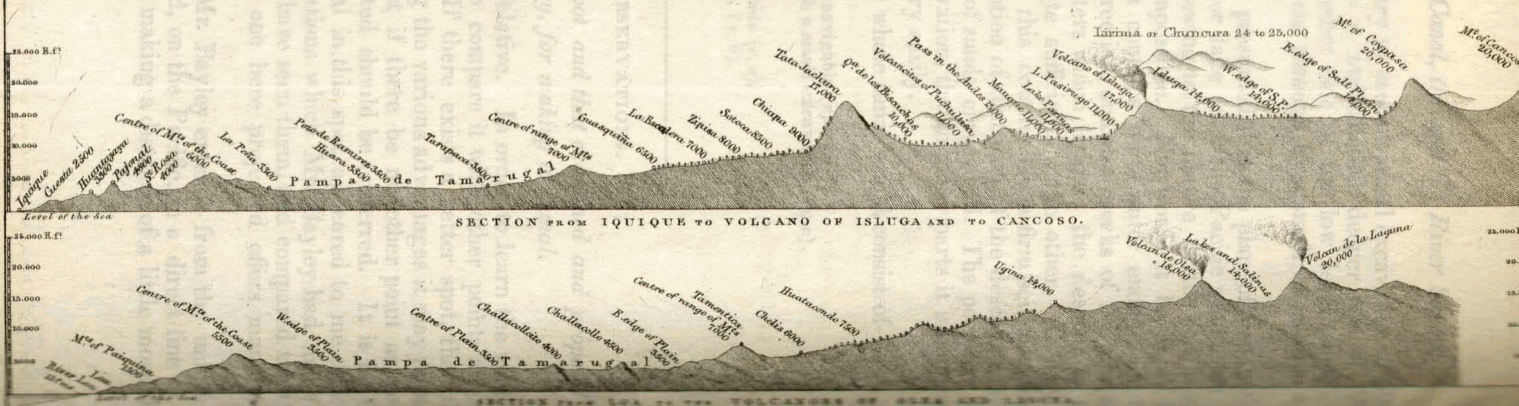
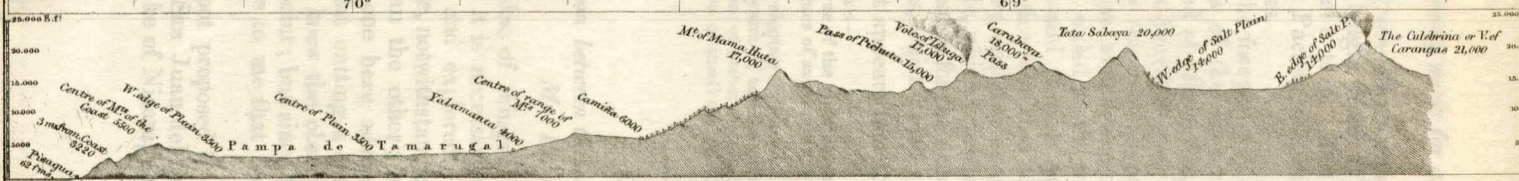




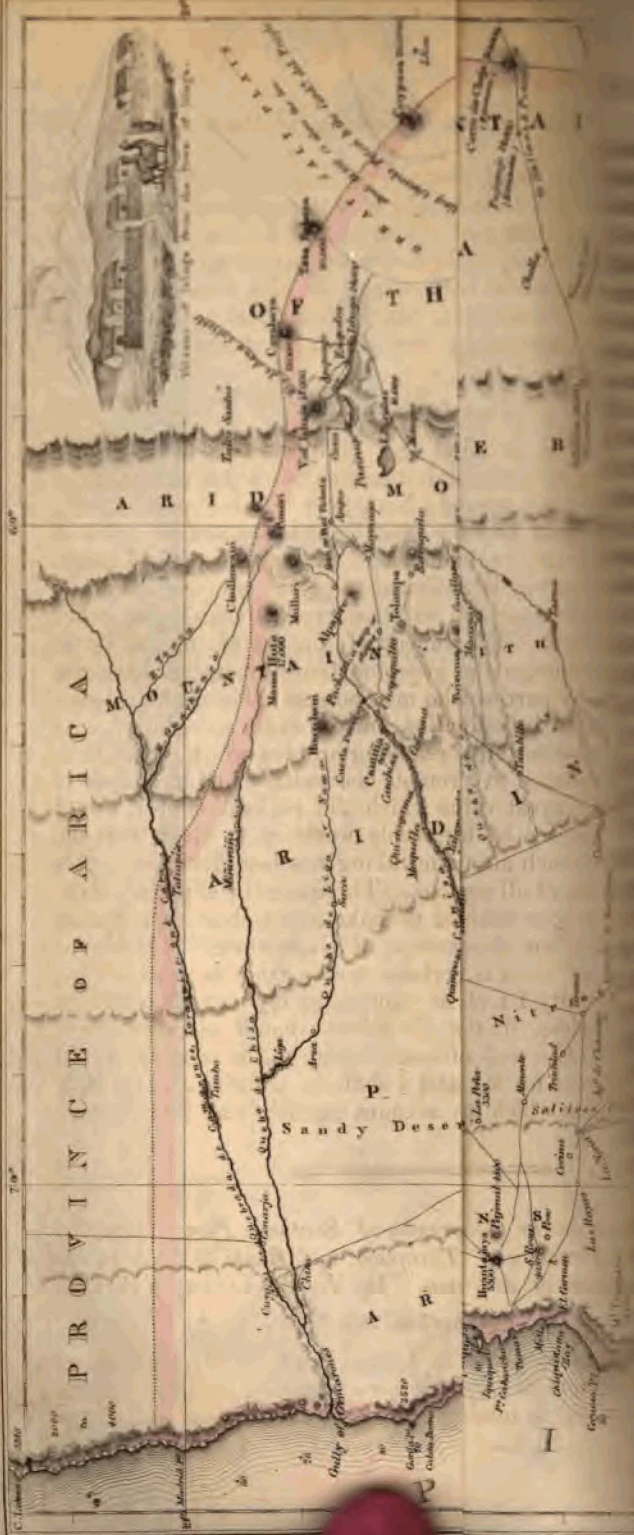
**SURVEY OF THE PROVINCE OF TARAPACA**  
 in the DEPARTMENT AREQUIPA  
**PERU**  
 commenced in 1827 by  
 W<sup>m</sup> Bollaert and G<sup>o</sup> Smith,  
 with additions to 1851 by W.B.  
 Drawn by A. Petermann.

**NOTE.**  
 Dry Quadrads  
 Quadrads with water  
 Quads with water & vegetation  
 & Mines of Gold, S. Silver, C. Copper.  
 Elevation in feet, depth in fathoms.  
 Scale: about 1/1,200,000 of Nature  
 Geographical miles.

White Copper or Pampa  
 Chala  
 Supp. pos. of Meteoric iron







C. Lawson del. 1733

71° 0'

65° 0'

At this point there ... require a tunnel of more than 1/2 of a ... station. Thus, while ... in the extent of both ... es two advantages ... vailable naturally:

the W. by the mountains ... des, with the volcano of ... ing smoke. "Medanos," or moving ... generally towards the N., ... S. In case of a heavy ... own about, and travellers ... n. They are of all sizes ... et.

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mines of Guantajaya, afforded me the opportunity of studying the physical geography, &c., of this but little frequented portion of Southern Peru.

In the month of December (the summer of that region) I left Valparaiso with the usual S.S.E. wind, which, during the night veering towards the land, forms the "terral," or cool breeze from the Andes; thus depressing the temperature of the air, dew is formed, and, as but little of it falls on the land, will account in some measure for the arid and desert character of the coast of Peru.

In winter, viz. from May to July, the winds are from the N., the air is charged with much vapour (*garua*), covering the summits of the mountains of the coast, where an occasional cactus and a few bulbous plants appear. This period of the year is known as the *Tiempo de Flores*, when also a few guanacoës may be seen roaming about these elevated flower-spots of the desert.

As Arica is approached barren undulating land is seen, and in its rear ranges of rocky sterile mountains, and farther eastward in the background the peaks of the Andes towering majestically above all.

*Arica*.—All around is a desert, save where a streamlet may run, giving rise to a vegetation, which is artificially increased by irrigation and manuring the land with guano.

The rock of the country is principally porphyritic, reposing on slate; the surface in the hollows and plains is covered with alluvial and saliferous matters.

*Tacña* is 30 miles inland by a desert route. It is supplied with water by a fair stream originating in the Andes, and is a thriving place. I returned to Arica by another track: the country travelled over was one scene of hopeless aridity, masses of rock covered with sand and salt.

As it seldom or ever rains in these latitudes, and there being no vegetation, the surface of the country has remained, and may still do so for ages, in the same state, unless disturbed by earthquakes or other volcanic agency.

*Islay*.—This port is about 100 miles N.W. from Arica, and, although in a desert, has since 1827 superseded Quilca, being free from "terciana" or ague, probably in consequence of there being no water in the vicinity but that which is conveyed to it by means of an aqueduct (*cañaria*). It is a mere landing-place amongst the rocks, although now the principal port of Arequipa.

The road from Islay to Arequipa passes up a ravine which cuts through the mountains of the coast before the great Pampa above is attained—an elevated desert plain, 3000 feet above the sea, its surface covered with sand and volcanic dust, and extend-

ing some 50 miles across ; bounded on the W. by the mountains of the coast, and to the E. by the Andes, with the volcano of Arequipa as a landmark, generally emitting smoke.

In these desert plains may be seen the "Medanos," or moving semicircular sand-hills, the concavity generally towards the N., on account of the winds being from the S. In case of a heavy gale these "Medanos" shift and are blown about, and travellers have been overwhelmed and lost in them. They are of all sizes, from that of an anthill to hundreds of feet.

Having passed the Pampa, another distance of 30 miles of barren hills is to be gone over, composed of volcanic rocks, sandstone, and here and there a little dark granite and their débris, when the vineyards of *Triabaya* appear, and a few miles farther is

*The city of Arequipa*, at the base of the volcano of the same name, which fire-emitting mountain was anciently called *Mistie*.

Arequipa is a picturesque, Spanish-looking city ; it has a considerable population and much transit trade with the interior of Peru. The first Spaniards visited the country as early as 1533, and the city was founded by Francisco Pizarro in 1539.

According to Haenke, who reached the summit of the volcano in 1794, the circumference of the principal crater was then about 1380 English feet ; a second crater was 440 feet in its largest part, and 120 feet in its least. The circumference of the volcano at its base he calculated to be 45 miles, and its elevation above the sea 17,454 feet.

Mr. Pentland, to whom we owe so much of our knowledge of the mountainous parts of Peru and Bolivia, makes the elevation of the volcano 18,300 feet, and the city of Arequipa 7788 feet above the sea.

Nearly the whole of the year the summit of the volcano is covered with snow. All around is composed of lava and ashes, which have been ejected from its crater.

Arequipa has often been visited by severe earthquakes ; those of 1582, 1604, 1660, 1667, 1715, 1725, 1784, may be particularised from their ruinous effects. The fearful earthquakes (*terremotos*) that shook nearly the whole of Peru took place in 1687 and 1746.

In 1667 there was a violent eruption of the volcano of Arequipa, after which its summit was first visited by Europeans, who found a large crater formed by ancient eruptions, and in the centre of it a cone, from the apex of which issued smoke.

In February 1600 there was a great eruption of the volcano of Omate (probably the *Uvinas* of Pentland), situated to the S.E. of Arequipa, accompanied by severe earthquakes, which destroyed several villages with their inhabitants, and is worth

noticing from the fact of ashes having been carried more than 100 miles distant from the volcano.

The mountains of the coast from Arica to Islay, as well as those to the N., have not the elevation of those to the S. of Arica; neither are they so well defined. They are composed of hard sandstones and porphyries, and sufficiently elevated to receive moisture from the thick mist (*garua*) in the winter months, which gives life to a few cacti, a little pasture, and some flowers on the lomas or summits.

*Province of Tarapaca.*—The first account we have of Southern Peru is in 1450, when the Inca Tupanki established for a time his court in Atacama, intrusting the command of an expedition to Sinchi Roca against the Copiapinos: this chief went as far as the fruitful plains of Maipu.

Almagro, when he parted from Pizarro to undertake the conquest of Chile, took the mountain route from Cuzco over the Andes, in which the sufferings of the expedition from cold, hunger, and fatigue were very great. He appears to have descended to San Pedro de Atacama, and thence to Copiapo and Coquimbo: whilst at the latter place (1537) it was that Rada, one of his officers, brought him from Peru information which decided him to return thither; but having experienced so many privations by the mountain track, he took that by the eastern margin of the Desert of Atacama. On this march the desert tracks of Atacama and Southern Peru were first discovered by the Spaniards, and some of his followers determined to remain behind in the less arid localities of Pica, Tarapaca, Camiña, &c., which contained Indian populations under their respective Caciques, Sanga, Opo, Ayyire, Taucari, and Chuquichamba.

Tarapaca was the most distant and extensive province of the empire of Peru, and so uninhabited and without the means of cultivation that it was almost disregarded by the discoverers, who, when they were questioned concerning it, replied by saying "that its tracks were over rocky mountains, sandy, uninhabited, and rainless deserts, covered with salt and without water, excessive heat during the day, and cold at night."

The physical features of this province, which will apply generally to all the southern part of Peru, may be described as follows:—

I. The arid mountains of the coast, which are of a porphyritic formation, running N. and S., rising oftentimes abruptly from the sea, from 3000 to 6000 feet above it, and some 30 miles in width, having large hollows and undulations in them; destitute of vegetation, and the greater portion of their surface covered with sand, salt, and other saline substances. When the sand and salt are found mixed it is called caliche, and may be regarded as a

superficial covering. The origin of the salt is not clearly made out; it has been called a saliferous alluvium, by some supposed to have been washed out of the mountains, by others to have been left there by the ocean.

In this range the silver-mines of Guantajaya and Santa Rosa are situated.

II. The Pampa, or Great Plain of Tamarugal, is from 3000 to 3500 feet above the sea, running N. into the province of Arica, and S. into the desert of Atacama, about 30 miles wide; much of it is covered with sand, salt, nitrate of soda, and other saline bodies. Water, derived from the mountains to the E., is found at various depths. A few tamarugos or acacia-trees are met with in the Pampa.

III. Thence rises a desert range of mountains, chiefly of sandstone, some 7000 feet above the sea, and 20 miles in width.

IV. An elevated district follows, much broken, and here for the first time are seen coarse pastures, brushwood, and large cacti. The pastures improve as they get higher up, until by the severity of the climate they diminish, and finally disappear at an elevation of from 10,300 to 16,000 feet.

V. We are now at the base of the Andes, or Cordillera Real, sometimes called the Western Cordillera of the Andes, in which are very high mountain ridges, including the Lirima, or Chuncura, 19° 47' S., 69° 12' W., supposed by my friend Mr. G. Smith, from a visit to its vicinity in 1850, to be 24,000 to 25,000 feet above the sea. Ille in Imará means snow: hence Illi-rima, and in Spanish the name Lirima. Crossing the high passes, and descending a little,—

VI. Is an elevated undulating region, known as the Puna, Paramo, or Sierra; this occupies a great extent of country N., S., and E., and is sometimes denominated the mountain knot of Potosi; in it appear high ranges of mountains, including the "snow-capped heights of Lipes," and farther to the N. and E. Ilimani and Sorata.

There are considerable depressions in this elevated region, where there are lakes containing fish, pasture is found, and a small quantity of quinoa (millet) is raised.

This great mountain knot, or rather the Peruvian Andes, may be looked upon as one of volcanic elevation, and contains several active as well as quiescent volcanos.

In the province of Tarapaca the two Cordilleras are not so defined as farther to the N., where they may truly be called the Peruvian and Bolivian ranges.

We know, however, but little of the geography of this great mountain knot in the district under consideration, doubtless the

seat of much volcanic action; indeed the Indians believe that the greater number of the mountain peaks have been formed by volcanos.

A survey of the province was made by Mr. Geo. Smith and myself in 1828, at the request of the Peruvian Government; the results of which have been introduced by Arrowsmith into his later maps drawn for the works of Captain FitzRoy and Sir Woodbine Parish.

The province of Tarapaca lies between  $19^{\circ}$  and  $21^{\circ} 30'$  S. and  $68^{\circ} 15'$  and  $70^{\circ} 22'$  W. It is bounded on the N. by Arica, on the E. by Bolivia, on the S. by the desert of Atacama, and on the W. by the Pacific Ocean. In 1628 it formed part of the province of Arica.

It is divided into four curatos or curacies, viz. Tarapaca, Pica, Sibaya, and Camiña, with a mixed population of about 11,000 souls, consisting of the descendants of Spaniards, Spaniards and Indians, and a few negroes, the greater proportion being Indians whose language is the Aymará.

Those Indians who hold land pay an annual tribute or tax equal to about 1*l.* sterling; other Indians without land, 16*s.*; the white population 12*s.*—the latter also pay a property-tax; the whole annual income of the province is under 3000*l.*

*Curato of Tarapaca.*—The town of Tarapaca ( $19^{\circ} 56'$  S.,  $69^{\circ} 35'$  W.) is the seat of government of the province, the chief of which is a sub-prefect. The ravine, at the mouth of which it is situated, rises in the Cordillera of Lirima. In general there is barely sufficient water to irrigate the land (which is carefully manured with guano), capable of cultivation in this quebrada, as well as in many others; but when thunderstorms with their heavy rains occur in the Andes, great torrents or avenidas rush down the ravines, bringing with them masses of rock, trees, huts, cattle, indeed all that may be in their way—leaving, after one of these sudden and destructive floods, nothing but a bed of stones. The houses are built of adobe or sun-dried brick, and seldom of more than a ground-floor, as a precaution against the frequently occurring earthquakes. The produce of the land is maize, wheat, alfalfa, lucern (*medicago sativa*), fruit, and a few vegetables. Up the ravine are the Indian settlements of Pachica, Laonsana, and Puchurca; in the vicinity of the latter there are some old gold, silver, and lead mines, formerly worked by the Spaniards.

On the road from Tarapaca to Guantajaya, and 6 miles W. of the Pozo de Ramirez, is the Cerrito de Huara, a “bramador,” or rumbling mountain, which is an object of curiosity to the traveller, but to the Indian one rather of fear. The sounds are generally heard about sunrise. This hill is situated in a desert plain; during the day the country around is exposed to great heat;

at night there is a considerable diminution of temperature, in consequence of the hot S. wind having gone to the eastward, where it gets cooled by the Andes, forming during the night the land-breeze; as the sun rises, the air becomes heated, expansion takes place, rapid currents and even gusts of wind are formed, which, striking upon the sides of the mountains, and setting the sand in motion, cause probably the roaring or rumbling sounds in question.

*Mamiña*,  $20^{\circ} 4' 48''$  S., is a large Indian town E. of Tarapaca. The potato is here met with in great perfection, and this locality is supplied with water from clear boiling sulphur-springs. Hereabout is much gypsum, alum, and carbonate of soda. *Hamitca* is in the vicinity, where there is a gold-vein, and in the *Cerro Colorado* are indications of gold, silver, and copper.

To the E. of Mamiña is the high range of *Yabricoya*, abounding in metals, principally silver, at the points known as *Picuntisa* and *Paihuanta*; the climate of these elevated mining districts is very severe, there being much rain, snow, and cold.

In the vicinity of Quipisca, W. of Mamiña, are many desert sandy ravines, and those unaccustomed to travel in such countries would be alarmed at the overhanging precipices, large masses from which have been thrown down by earthquakes. The road from Mamiña to Pica passes through several deep dells without water. *Pozo de Ramirez* is a well 60 feet deep, sunk in the pampa for the use of travellers. In this province, as well as in many other parts of Peru, no one starts on a journey without a pair of bullock's horns (chifes) full of water slung in front of his saddle, provisions in the saddle-bags, and a thick poncho or two to serve as blankets, as at times he may be for days without falling in with water or a hut.

*Iquique*,  $20^{\circ} 12' 47''$  S.,  $70^{\circ} 14'$  W., is the principal port of the province, sheltered by an island (which was formerly thickly covered with guano, since removed), and situated at the N.W. extremity of a low tract of ground, surrounded by high and barren mountains. Iquique stands on a stratum of broken shells (principally cytherea) in all stages of degradation, in some places several feet thick, intermixed with others similar to those now inhabiting the neighbouring seas, and have in all probability been elevated above the level of the ocean at no very distant date: the general opinion is that there is a gradual upheaving of the whole line of coast, extending some distance inland; on this point Mr. Blake\* observes that fragments of recent shells have been found in the pampa of Tamarugal, which is 3000 to 3500 feet above the sea, and distant from it 30 to 40 miles. Iquique owes its present importance as being the shipping port of the salitre, or nitrate of soda, found on

\* Geological and Miscellaneous Notice of Tarapaca, by J. H. Blake: American Journal of Science, April, 1843.

the western margin of the Pampa de Tamarugal, and of silver, mainly from the mines of Guantajaya and Santa Rosa.

There is neither wood, water, nor vegetation here; most of the water is brought from Pisagua, 45 miles to the N., and is often very brackish; provisions come from the interior and Chile.

The population is employed in shipping nitrate of soda and in fishing, particularly for the congrio (of the conger eel family); there are a few other sorts of fish, which, with mussels, limpets, sea-eggs, and a few small crabs, is the only food to be met with.

The place is healthy and there is no ague.

During three years' residence at Iquique I only once saw a slight shower of rain, barely sufficient to lay the dust. Mean winter heat  $63^{\circ}$  at 8 A.M.,  $67^{\circ}$  at noon,  $62^{\circ}$  at 8 P.M.; summer heat,  $72^{\circ}$  at 8 A.M.,  $78^{\circ}$  at noon,  $74^{\circ}$  at 8 P.M.

Of sea-birds there are immense flocks, including the cormorant, pelican, booby, gull, shag, &c. To these birds is owing the existence of so much guano found on the coast of Peru. From the period of the first shipment of guano to Europe in 1838 to April, 1851, about 1,000,000 tons has been imported into Great Britain, Peru alone having supplied 435,000 tons. From 1850 to the first three months in 1851, there was imported from Peru alone 97,000 tons.

Of land-birds, condors, vultures, hawks, and turkey-buzzards are numerous. There are a few bats, many rats, mice, fleas, and mosquitos in abundance engendered by wet sea-weed; a vinchuca is occasionally seen.

Iquique is the only village on the coast of the province; the other places named in the charts are merely headlands, beaches, islands, &c., visited by the fishermen from Iquique in search of congrio, seals, and sea otters, in their ingeniously-constructed balsas, or floats made of seal-skins, inflated with air. During their stay at such places they live in caves or wretched cabins built of whales' ribs covered with seal-skins, and subsist on water, maize, and fish which they take with them. An old fisherman, on being asked how he amused himself when not at his labours, replied, "Why, I smoke; and as I have consumed 40 paper cigars a day for the last 50 years, which cost me one rial each, will you have the goodness to tell me how many I have smoked, and how much I have expended in tobacco?" The answer was 730,000 paper cigars, value 470*l.*! And this was a poor fisherman.

With the present steam navigation along the Pacific, facilitating the transport of merchandise and provisions, I am led to believe that this, perhaps the most barren coast in the world, will sooner or later be carefully "*cateado*," or examined for mines, and it would not surprise me to hear of important discoveries of the precious and other metals, as also of valuable saline deposits; then, although large cities may not rise up, places of commercial importance will

line the coast. I will mention a few places on this line of the coast of the province worthy of further examination, viz. :—

1. *Alcaparosa* ( $19^{\circ} 29''$  S.), N. of Pisagua. Here is much sulphate of iron, resulting from a decomposition of the sulphuret : the latter is looked upon as a criadero or breeder of gold. N. and S. of the quebrada of *Pisagua* silver veins are met with. *Chanabaya*,  $20^{\circ} 40''$  S., is another important spot ; and if water and provisions could be placed there at a reasonable rate, it is the general opinion that another silver-mine like Guantajaya would rise out of the desert ; here both gold and silver are found. *Chuchulai*, in  $21^{\circ} 8'$ , contains silver veins ; and at *Paiquina* and *Ch'pana* (in  $21^{\circ} 25'$ ), N. of Loa, some gold has been found. To the S. of Loa there was formerly a great deposit of guano. At *Paquique*, in  $21^{\circ} 56'$  S., and 10 miles S. of it, are the recently-discovered rich copper-mines of *Duendes* and *Tocopillo* : the first cargo from the former left for England early this year (1851). Water is brought to these new mines at the rate of 30s. per tun. In concluding the subject of Iquique I may mention that in 1815 a Chinese junk anchored in its port, and a party of Chinese visited the mines of Santa Rosa.

*Guantajaya*.—These celebrated silver-mines are 7 miles from Iquique, and in  $20^{\circ} 14'$  S.,  $70^{\circ} 7'$  W. They are reached from the port by proceeding over a plain, through which runs an immense ridge of sand. The track is then a winding one along the slope of the mountains to the "Caracol" or steep zig-zag road. At the summit the ground is loose and sandy, thickly covered with large angular pieces of rock, some in an advanced state of degradation, to which ages of solar heat has given a calcined appearance, some having crumbled into powder. Here is much salt, of a variety called clinkers, looking as if they had oozed out of the earth and crystallized by the sun's heat. They have at a distance the appearance of a collection of bones, and the scene is one of absolute sterility. The mountains of Guantajaya, Santa Rosa, and others, are seen towering above the surrounding country. Everything is of a dull brown colour, except the bluish ranges of the Cordillera, in the distance, covered with snow.

These mines have rendered the province of Tarapaca so celebrated in Peru that it has sometimes been called the Potosi of the south.

They were discovered about 1556, it is said, by Spaniards from Arica, who worked at a spot called the Chiflones, but who after a time abandoned them. The mines were re-discovered by an Indian named Cucumate, during one of his journeys to the coast for guano, who made them known to Juan de Loyaza, who commenced working them, but died without reaping much benefit. In 1718 Loyaza's son, Don Bartolomeo, found rich ore in the



vein of San Simon, and in 1727 the Paniso\* or unconsolidated rock (composed of argillaceous limestone containing fossil shells) at the foot of the mountain was discovered, in which were found the papas or insulated masses of silver; one found in 1729 weighed 800 lbs., another in 1794 of 400 lbs. In 1746, the Paniso having been bored through, the principal vein was met with, which led to the discovery of many others. The ores are native chloride and sulphuret of silver, and their combinations with copper, lead, &c.; the gangue or matrix is of carbonate of lime.

It was computed in 1826 that the mean annual amount of silver extracted up to that time since 1726 was 750,000 dollars, which would give a total of about 15,000,000*l.* sterling. Since 1826 the produce of the mines has been very irregular, not averaging more than 30,000 dollars a-year.

There are about 50 mines, and in one only has water been met with, but so impregnated with salts of copper as to be unfit for drinking. Had good water been obtained, its value would have been greater than the richest mine.

In such a desert spot labour is expensive, and the mining operations are generally carried on in the veins only, not working by shafts and adits; the system there being to extract little or no loose rock, and, as new works are opened, to throw the loose stuff into older ones: this has caused the mines to be called *enterado*, or buried. Periods elapse when but little silver is extracted; then a *boya*, or rich discovery, is made: one amongst these was a mass of nearly pure silver 15 yards long and in places a yard thick.

The mines being so irregularly worked, some time will pass ere *boyas* present themselves; and some writers on Peru, hearing that these mines were *enterado*, have erroneously concluded that they were worked out.

Were it not encroaching on the subject of this communication, I might indicate positions where rich veins could be cut at other levels and other veins discovered. This, however, belongs to the mineralogy of the province, and is only locally interesting.

In flourishing times as many as 4000 persons have been employed at these mines, and I have seen as few as 150. The principal habitations are built of wood brought from Chile, the rest of caliche (sand combined with salt).

The water for drinking is brought from the wells of Almonte (s. g. 1·00165, temperature 70° Fah.), distant 21 miles, in llama-skins containing 14 gallons, selling for 4*s.*; when scarce for much more. For a live sheep 10*l.* has been paid, and 20*l.* for a live ox brought from Atacama—an enormous price in South America.

\* See vol. ii. No. 54, Proceedings of Geological Society, 'Description of Insulated Masses of Silver found in the Mines of Guantajaya,' by W. Bollaert.

At times it is distressing to see the miners returning from a sultry mine, the temperature of which is often 100° Fah. (highest exterior temperature 78° in the shade), and obliged to go on foot to the wells of Almonte for water. Mean winter heat, 8 A.M. 53°, noon 64°, 8 P.M. 56°; summer heat, 8 A.M. 73°, noon 76°, 8 P.M. 64°.

The mines of *Santa Rosa* and those of *El Carmen*, discovered in 1778, are distant from the preceding 5 miles. Independently of yielding the class of ores similar to those of *Guantajaya*, there is much sulphuret of silver and copper (cochiso). From 1815 to 1825 one mine gave 600,000*l.*; and a boya in the *Arcos* mine, 3 yards long and 20 in height, gave 100,000*l.*

S. of *Santa Rosa*, on the track from *Iquique* to the nitrate of soda works of *La Nueva Noria*, is a curious spot called *Las Rayas*, from some rude Indian works of art, said to have been made by them before the conquest. My friend Mr. Seymour, who examined this spot, gives me the following account of it:—"The side of one of the barren hills, in particular, is laid out as if for a garden, with a large double circle in the centre, and paths branching off, dividing the ground into compartments. The loose stones having been carefully picked off the paths, which are rendered hard apparently by the feet of people, it is supposed that religious ceremonies were performed here. In the vicinity is the representation of a llama, produced by taking away the loose dark stones from the side of the mountain, inside the outline." These representations of animals are called *Pintados de los Indios*, or Indian pictures: of this sort there are many specimens in the *Quebrada de los Pintados*, the pictured ravine at *Mani*, as well as in other parts of the province, and may be seen from a long distance. These *pintados* must not be confounded with the engravings and sculpture on rocks found in *Central* and other parts of *America*; those which I saw in the *Quebrada de los Pintados* appeared to be of recent formation, viz. since the conquest.

The *Salinas de Ceremeño* are 15 miles S. from *Iquique*. Common salt is found on a small plain 15 to 20 feet above the sea and 1500 yards from the rocky shore, which has been evidently uplifted from it. The salt is friable and crystalline, sometimes taking a curved appearance. It is met with in mounds, and a little below the surface, from 1-8th of an inch to 2 feet thick, and free from earthy matter. It is in layers between irregular strata of rock, in which are perpendicular splits also filled with salt, one layer communicating with another. When the layers are thick they are made up of five or six smaller ones; they have an inclination towards the sea of 2° or 3°. Ship-loads are occasionally taken to *Chile*.

In a plain near the *Ansuelo* rock at *Iquique*, and some 1000

yards from the shore, sea-water is found near to the surface. At the margin of the beach there is a sandy ridge or elevation, behind which the land is depressed. It is in this depressed part where the sea-water is found near to the surface, where it readily evaporates, leaving layers of salt. Spring-tides will add to these depositions; and now let the land be upheaved, and we have the origin of so much salt as at Ceremeño, and doubtless what has and is still taking place on other parts of the coast.

The existence and origin of salt and other saline bodies near to the ocean, and in a tropical climate, and where it seldom or ever rains, is not difficult to understand; but when it is met with on the mountain range of the coast, in the Pampa of Tamarugal (here in company with nitrate, sulphate, muriate, carbonate of soda, borate of lime, &c.), as well as high up in the Andes, 15,000 to 16,000 feet, and perhaps higher, with, as I presume, none of the rocks considered as saliferous, it is a curious matter of speculation, and would tempt one to surmise that so much salt, in such elevated positions, may derive its origin from other sources than the ocean, viz. volcanic, and the slow but gradual decomposition of rocks containing the bases of saline materials in their composition.

Mr. Smith writes to me in 1850, "The large salares or calichales (collections of salt) appear to be drawn from the earth by a powerful sun acting on a surface moistened by heavy dew (garua). I think we nearly bared the mountains about Santa Rosa when I sold a quantity of salt to Captain Bowers in 1827; *there is now a very fair new crop upon them.* I lived in a house at Iquique, some years since, which had bricked floors; the principal apartment was matted, and over it carpeting; before these were laid down the floor was well washed with sea-water; some months afterwards we observed the floor to be getting very uneven and lumpy: the carpet and mats were raised, when we found a beautiful white salt, in very small crystals, in some parts an inch thick, and as dry as a bone."

*Curato of Pica.*—The town of Pica (originally Tica, meaning flour), 20° 30' 8" S., 69° 24' W. (the church), is on the eastern margin of the Pampa, on a very sandy soil, at the base of an arid range of mountains, above which is an elevated tract, where the humidity of the air and occasional rain produce coarse pastures, such as ichu (*Stipa eriostachya*), iru, and sajana, upon which feed the domestic llamas, alpacas, and sheep, and in the more retired parts the wild vicuña and guanaco. Some large cacti and a little brushwood are seen, and, ascending in an easterly direction, the sierras or frozen regions of the Andes are entered.

The land at Pica capable of cultivation is very limited, the chief supply of water being from inconsiderable thermal and other springs,

their temperatures varying from 55° to 98°; the water is collected in “*cochas*” or reservoirs, and carefully distributed to the vineyards and farms, some of which are supplied with water by means of “*socabones*” or adits driven on a slight incline into the neighbouring rising ground; some of these adits are more than 2000 yards long, and may have been commenced by the Indians, before the arrival of the Spaniards. The farms of Pica consist of small vineyards, orchards, vegetable gardens, and plots of alfalfa. Among the fruits are the grape, from which wine and brandy are made, figs, guavas, melons, chirimoyas, pears, peaches, quince, small but very sour lemons, pomegranates, tuna (the fruit of the opuntia), date, pacay (*Prosopis dulcis*), the largest tree of the country, and the favourite aji or capsicum, which the Peruvians use in almost every dish. The district of Arica is said to yield *aji* annually to the amount of 120,000*l*. Olives are also cultivated, canes for thatching, a little cotton, camotes or sweet potatoes, the castor-oil plant, chañar, capulies (*Prunus capulin*), and a few other plants.

The principal houses are built of sun-dried bricks, but only of one floor in consequence of earthquakes; the majority of the dwellings are merely bamboo huts, plastered with mud, and have flat roofs, having the appearance of so many square-boxes. The streets are covered with much loose sand, which in the day-time during summer becomes very hot and most disagreeable to walk on: so much so that the inhabitants keep a horse or mule saddled at the door to ride from house to house. This spot suffers from ague; a bad sort of which is known as tabardilla, chucichuc, and even peste (plague). The remedies used are, doses of sal San Sebastian (sulphate of soda, found hereabouts in large quantities), Peruvian bark mixed with wine, and lemonades. This local visitation is more fatal to the Indians than to the mixed breeds; consequently localities subject to this autumnal fever are avoided by the former.

Owing to the loose nature of the soil in this vicinity the effects of earthquakes are very severe. Locusts at times do great damage, and the binchuca, or black bug of the pampas, is common. The Cerro de Chuchulai is famed for its “*buenos panizos*,” or as affording favourable indications of gold and silver and other metallic veins.

*Matilla*, 20° 31' 22", is S.W. of Pica; its farms are supplied with water from the little valley of Quisma, as well as from adits. This vicinity was comparatively populous before the conquest, in proof of which there are many ancient huacas, or Indian tombs, to be met with.

The *Pampa de Tamarugal* takes its name from the tamarugo, or tamarisk-tree, likewise called carob, espino, and algaroba

(mimosa). This tree, the only fuel of the country, grows wherever water reaches the pampa from the ravines to the E. Formerly there was much more of this wood, but its constant use for fuel (the growth not keeping up with the consumption) has greatly decreased it. In the same localities there are buried underneath the soil large collections of dead wood, also used as fuel. This has sometimes been called fossil wood, and appears to be a different tree from the present algarobo. Mr. Smith, in a letter to me in 1850, says, "You know that forests of fossil wood have been dug up in the pampa; and, singular to relate, the whole trees were found lying in the same direction, as if swept down at the same instant, either by a hurricane or a torrent of water from the mountain ravines." The pampa extends throughout the whole length of the province, appearing to be elevated towards the N.; its height above the sea is 3000 to 3500 feet. It may be considered as a continuation of the desert of Atacama. Its surface is strewed here and there with pebbles, patches of sand, salt, nitrate of soda, and other saline bodies; marly strata follow, reposing on beds of rounded stones, and, lastly, rock is met with.

By sinking wells water is obtained at various depths; near to the eastern margin it is not far from the surface, but towards the western it is deeper. A curious point about this water is, that although there is so much saline material covering the plain, little or none of it is contained in the water.

On the E. a few ravines descend into the plain from the Andes, bringing down a small portion of water, while there are other ravines quite dry. Only three of these *quebradas* reach the sea—viz. Loa, Pisagua, and Camarones—their waters being brackish, having traversed so saliferous a country.

The view of the Andes from the western border of this plain is very fine. The sky is cloudless in summer, and the heat of the day intense; but the nights are cool even in summer, thanks to the land-breeze. Shooting stars and meteors are seen to perfection at night, darting into and across the plain; but the deceptive *mirage* sadly tantalises the traveller in want of water. The Indians call the *mirage* "flying lakes;" and on the road from Almonte to La Tirana large numbers of these may be seen in the distance, with even the shadows of the algarobo trees reflected in them.

Although a level plain, still, when rains have been abundant in the Andes and have escaped by the ravines into the pampa, water-courses have been formed, producing some irregularities. About noon in summer it sometimes blows strongly from the S.W., when the sand and dry loose earth (*caranso*) is carried before it in large quantities, and is very annoying to travellers. Whirlwinds of this sand, and even landspouts, are seen over the plain. In

1830 there was a terrible sand-storm, the gale blowing from the S. : the sand was lifted up more than 100 yards into the air ; the sun was obscured ; the people in the little villages were greatly terrified, and hurried to the chapels to embrace the statues of the saints and pray to them for protection.

*La Tirana*, 20° 21' 27" S., 69° 43' 30" W. From Pica to this place the track goes zigzag through patches of espino-trees, passing the noria, or well, of Ramirez. As there is some land here free from saline matters, but containing no humus, mould, or decayed vegetable material, experiments were made in 1820 to render the barren lands fit for cultivation : by sinking wells, extracting the water by means of pumps (norias), and irrigating the pure marl and sandy soil, some wheat, lucern, maize, and vegetables were grown. Mr. Smith writes, in September, 1850, that Mariano Morales had been for some time making a farm, which he calls "Chacra sin riego," or a farm not requiring irrigation. He had cleared off two feet of earth from the surface, thus approaching the water below the pampa to within three feet, and obtained sufficient moisture to grow wheat, maize, barley, rice, vegetables, &c. Should success attend this most novel mode of culture, it will be of great benefit to the province, and cause many to turn their attention to it. The Aguadas of Santana, Chancas, and Hidalgo are other *Chacras sin riego* in the vicinity.

At La Tirana water is met with a few feet from the surface (s. g. 1·00255), and, when heavy rains occur in the Cordillera, small streams reach as far as this. The greater part of the silver ores of Guantajaya and Santa Rosa are amalgamated at this spot.

At the *Wells of Almonte* water is found at a depth of 30 yards (s. g. 1·00165, temp. 70°). The mines are supplied from these wells. Here is also an amalgamating establishment.

*Nitrate of Soda.*—The existence of this valuable substance in the province of Tarapaca has been known in Europe about a century. In 1820 some of it was sent to England, but, the duty then being so high, it was thrown overboard. In 1827 efforts were unsuccessfully made by an English house to export it. In 1830 a cargo was sent to the United States ; it was found unsaleable there, and a part of it taken to Liverpool, but was returned as unsaleable in England. A cargo was then sent to France, and in 1831 another to England, when it became better known, and sold as high as 30s. to 40s. the cwt. Its price has varied very much ; present quotations (1851), about 15s. Since 1830 to 1850 the exports of nitrate from Iquique have been 5,293,478 quintals, equal to 239,860 tons ; some of it being used as a fertilizer of land, some in the manufacture of nitric acid.

The principal deposits of nitrate of soda yet known are found

on the western side of the Pampa de Tamarugal, commencing immediately where the level plain ceases, and on the sides of some of the ravines running from the Pampa towards the coast, and in some of the hollows of the mountains. The nitrate has not been found nearer to the coast than 18 miles, and looks as if it gradually transferred itself into salt as it approached the coast. The oficinas, or refining works, are divided into northern and southern salitres; the old salitres being about the centre of the former, and La Nueva Noria that of the latter; there are in all about 100 oficinas.

The nitrate deposits commence about Tiliviche, and extend S. near to Quilliagua, with interruptions of deposits of common salt. The nitrate caliche grounds vary in breadth; the average may be 500 yards, and in places 7 to 8 feet thick, and sometimes quite pure. In the ravines and hollows before mentioned the nitrate is found on their shelving sides; the hollows look like dried-up lakes, and are covered with salt 2 to 3 feet thick, and on the margins there is nitrate of soda, oftentimes going down to some depth; in others there is a hard crust upon it, occasionally 4 feet thick. The nitrate caliche found under this crust is in thin layers, and so solid and pure as to be sought for, although the expense of blasting is very great.

There are several varieties of the nitrate of soda caliche, the following being the principal:—

1. White compact, containing 64 per cent.
2. Yellow, occasioned by salts of iodine, 70 per cent.
3. Grey compact, containing a little iron and a trace of iodine, 46 per cent.
4. Grey crystalline, the most abundant variety, contains from 20 to 85 per cent., affording traces of iodine, with 1 to 8 per cent. of earthy matter.
5. White crystalline: this resembles the refined nitrate. All these contain common salt, sulphate and carbonate of soda, muriate of lime, and occasionally some borate of lime is found under the nitrate beds; one variety of the latter, composed of boracic acid 49·5, soda 8·8, water 26·0, lime 15·7=100, may probably become of use in this country in glass-making. &c.

Fragments of shells have been noticed with and under the nitrate beds; this may account in some measure for the lime in the borate and muriate. Mr. Blake mentions that 200 feet above the Pampa (which is 3500 above the sea), near to Los Salitres del Norte, "limestone containing shells rises from a bed consisting of pebbles and shells cemented together by salt and nitrate of soda. Part of the shells are decomposed, whilst others are perfect in form, and like those now still found living on the rocks in the inlets of the sea."

The rough nitrate of soda is broken into small pieces, put into boilers, water introduced, and the whole boiled; the nitrate is held in solution, whilst the earthy matter, salt, sulphates, &c., are separated, and fall to the bottom of the vessel: the saturated solution of nitrate is let into a reservoir, where it deposits any remaining earthy matter; the clear liquor is run into shallow troughs, exposed to the sun; crystallization takes place, containing only 2 to 3 per cent. of impurities, and is ready to be conveyed to the coast for exportation.

The Pampa de Tamarugal contains sufficient nitrate for the consumption of Europe for ages; the desert of Atacama yields it; it has also been met with in the Andes and in the eastern plains.

Passing *El Pugio*, a small farm on the road from Pica to Guatacondo, and the Rio Salado, the route leads by Cuevas, Tambo, Ramada, and Chipani, halting-places without water. Having passed the Cuesta de Chelis, and descended into the deep ravine of Guatacondo, a few trees and shrubs are seen amongst masses of granite and other rocks. In ascending the ravine it becomes very narrow, and at one place it is taken up by a *chajagua*, or waterfall. In order to pass this *angostura*, or narrow, a path has been cut out of the overhanging rocks, a few miles from which is the Indian village of

*Guatacondo*, 20° 57' 51" S. Here granite, clay-slate, sandstone, porphyries, and their débris are seen in perfection. High up the ravine towards the Cordillera are the gold and copper mines of Ugina. The produce of the valley is maize, fruit, vegetables, and a few sheep are reared. Impejza, Tigua, and Yareta are the names of silver-mines in the vicinity.

From the heights of Guatacondo there is an extensive view into the desert of Atacama. The mountains of Conche, famed for their gold and copper mines, may be also seen. It is from that part of the country where the green sand, or atacamita (muriate of copper), used for sanding letters instead of blotting-paper, chiefly comes.

*Quebrada de los Pintados*, or the pictured ravine. Here are representations of Indians, llamas, dogs, and other forms, on the sides of the dells, as well as in the *Quebrada Onda*, similar to those described at *Las Rayas*; the figures are 20 to 30 feet high, cut in the sandy marl, the lines being from 12 to 18 inches broad, and 6 to 8 deep.

*Mani*, 21° 10', is the most southern inhabited spot of the province. Near to this are some old gold-works, as well as at *Catigna* in the *Quebrada Onda*. Proceeding towards the coast,

*Quilliagua* is in the valley of Loa, where a few Indians reside. This stream, which is regarded as the southern boundary of Peru,



is generally 5 feet wide and 5 feet in depth, and is brackish, but during the rainy season in the Andes its volume of water is augmented. It is in contemplation to open a canal above Quiliagua, in order to irrigate the neighbouring plain for the purposes of cultivation.

*Loa*, on the coast, in  $21^{\circ} 30''$ , is the abode of a few fishermen. To the N. are the deserted gold-mines of Chipani and Marejo.

*Pavellon de Pica* is a hillock on the coast, from whence large quantities of guano have been and are still taken. A pilot named Reyes was the first to collect guano here; the deposit was then 1 mile long and 300 yards wide.

*Mines of Chanabaya*.—These are of gold and silver. It takes three days to transport water and provisions to them from the interior. There are a dozen small mines. From what I have been able to learn of this place, I am inclined to think, now that there are such facilities afforded by steam navigation, that this spot deserves further notice, and might be got at with comparative facility from the coast.

*Curato of Sibaya*.—*Sibaya*,  $19^{\circ} 47' 33''$ , is an Indian town to the E. of Tarapaca. Much maize is grown, and sheep and llamas are bred. There is a route from this place to Potosi, across the Andes, which takes the Indians 12 to 15 days. From Sibaya to Mocha there are two tracks, one by the mountains, used when the valley is impassable by reason of the sudden rushes of water through the angostura or narrow, which is 2 miles long, 800 feet deep, 2 or 3 yards in width, and in some places almost excluding the light of day. These angosturas appear to have been formed by earthquakes; they are sometimes called rajas, splits, or fissures. This pass, although originally a fissure, has been worn down by torrents some 20 to 30 feet more, the latter distance being remarkably smooth; the rock is a dark blue slate.

*Mocha* produces wheat and maize, and here resides a family named Quispe-Sugso, descended from the Incas, which is exempt from the payment of tribute on that plea.

*Usmagama*, *Chusmisa*, and *Guasquiña* are Indian hamlets where llamas are reared; wheat, maize, and potatoes grown. Gigantic cacti are hereabouts seen, 20 feet or more high, a foot thick, and when split serves for doors and even rafters. *Usmagama* is at the bottom of a very deep ravine prettily surrounded with trees, and has a picturesque appearance from the mountain road to Zipisa: the track is steep and dangerous, along a precipice in a zigzag course, some of the steps being cut out of the solid rock, and at great distances from each other, so that a mule in descending is obliged to drop both the fore feet at once, which is not pleasant to the rider.

At *Guasquiña* there is much gypsum, and on the heights abun-

dant depositions of débris from the higher country, containing sulphuret of iron, supposed to be a favourable indication of lavadero gold. On leaving Guasquiña for Zipisa, the track leads up the N. side of the ravine; it is cut out of the mountain, and looks nearly perpendicular: the road is firm, but so narrow that there is much danger when travellers or troops of animals meet. From the summit of this road the track is most mountainous, until a dry deep quebrada is attained, which is entered by an escalera, ladder path, or flight of steps, at an angle of  $45^{\circ}$ , cut out of the rock, a sort of road the Indians of old knew so well how to construct. Here travellers are obliged to dismount and lead their animals.

*Zipisa*,  $19^{\circ} 38' 6''$ , is in a very rugged country, supplied with water from springs, conveyed by a long acequia, or aqueduct, which is made to wind round the mountains, a system well known and used by the Indians long before the conquest. Here is a sanctuary, the resort of the pious and others in the month of June. It is a pretty spot, where a few paraquets, wood-pigeons, and small birds are seen.

*Sotoca*,  $19^{\circ} 36' 18''$  S., is reached by a mountainous up and down track, and half way between it and Zipisa both villages are seen beneath the traveller apparently at only a stone's throw. In the mountains of Yaracagua is a silver-mine; and as there is much sulphuret of iron in the débris that cover these mountains, it has been supposed that such will some day or other lead to the discovery of *lavaderos* or gold-washings.

*Curato of Camiña*.—At the bottom of the ravine of Camiña is the *Port of Pisagua*. It is from here that Iquique is supplied with water, but the stream seldom comes down to the beach. It is reported that the mountains in this vicinity afford indications of gold, silver, antimony, and copper, but sulphuret of iron is in such abundance as to give rise to large formations of sulphate of iron or *alcaparosa*, a solution of which natural salt, added to the resinous pods of the tara (a species of mimosa containing tannin), forms the ink used in the country.

*Huayna Pisagua*.—Nitrate of soda from the northern salitres is shipped from this port, as well as from Mejellones.

*Tana*.—Some alfalfa grown here, and there are large deposits of salt in the vicinity. This quebrada of Camiña, like the other two of Loa and Camarones, cut straight through the Pampa, is wide in parts, narrow in others: their structures are alluvial, and imbedded in them are rounded and other masses of rock resulting from the mountains to the E.

*Quimpasa*, Yalamanta, Moquella, Quistagama, Cuisama, and Chapiquilta are hamlets before reaching the large Indian town of *Camiña* (anciently Carvisa, one of the names of the llama), where maize, alfalfa, grapes, and olives are grown. Much of the culti-

vated land is far above the level of the stream, formed into terraces and watered from above by means of an aqueduct brought some distance from up the ravine. Here may be seen the domestic llama and alpaca, and a little higher up in the mountains the wild guanaco and vicuña. In the N. part of Chile the llama is called moro-moro; the guanaco luan, and when tamed the chiriqueue. At Camiña is an ancient Indian cemetery, "huaca," or sacred place; the bodies are buried in a sitting position with the arms across the breast, and wrapped generally in cotton cloths. Sometimes articles of value, such as images of gold and silver, are found in the huacas, as well as pottery with designs in alto-relief.

The track from Camiña to Isluga leads up the ravine through trees and shrubs. Leaving the quebrada to the N., by a long ascent, you arrive at the

*Cuesta de Parasuya*, without any road being distinguishable from the numerous tracks formed by the herds of llamas and sheep that graze in the mountains. These tracks continue nearly to the pile of stones known as the Pass or Pascana of Pacheta. The Indian who passes here will bring a stone, even from a distance, in order to add another to the pile. These piles are not uncommon in the Andes.

*Maymaga* is near a marsh, the waters of which issue from springs. Now and then a chinchilla and biscacha may be seen, also condors, eagles, and wild geese. At sunrise in November the temperature was 26° Fah. These solitary and dreary spots, of which there are several in the Cordillera, are called *estancias*, and are the residence of a few Indian families, occupied in breeding llamas, and jerking or drying meat. From Maymaga N.E. to the marsh the level land becomes contracted by the vicinity of the mountains; a *cuesta* is ascended, when, after passing the

*Estancia of Mauque*, the track becomes very bad over rising barren ground without a vestige of vegetation, until a high pass in the Andes is reached, known as the

*Abra de Pichuta*, with its pile of stones, which I have estimated to be at least 15,000 feet high. Much inconvenience was experienced in crossing this pass in consequence of the violence of the piercing wind from S.E. From this spot the volcano of Isluga was seen (giving out considerable volumes of vapour), as well as many snow-capped peaks and ridges. Descending from the pass through a ravine, the caves and stream of *Pasirugo* are met with, being the temporary resting-place of the Indians whilst tending their llamas.

*Anquaje* is on the lake of the same name, and is a llama farm. From here five small craters of the volcano of Isluga are seen;

two of the craters are near the summit, three some distance down the S. side.

*The Volcano of Isluga* is not very conical, but occupies some extent. It was winter when I was there, and then it was thickly covered with snow, even to its base. During the summer sulphur is collected about the craters. Loud rumbling noises are heard in its vicinity, and earthquakes are often experienced. I give as the approximate elevation of this volcano 17,000 to 18,000 feet above the sea. I believe Mr. Smith and myself were the first to make known in Europe the existence of this volcano.

Commencing in the S. there is—1, the volcano of Copiapo; 2, Atacama; 3, Olea; 4, Laguna; 5, Volcancitos of Puchultisa; 6, Isluga; 7, Carangas; 8, Uvnas (quiescent); 9, Arequipa; besides others: indeed, from the character of the rocks of the country and their débris, I should say that the whole of the Cordillera in these latitudes and far N. and S. is one mass of volcanic rocks.

Passing *Enquelca* (estancia), which is on the border of a lake, the Andean town of

*Isluga* is reached. This is the largest village in this part of the Cordillera, on a good-sized stream, which comes from the mountain of Carabaya, running into the lake of Isluga. S. of the village the waters from the lake run eastward into the plain of Sitani. In these inland waters there is an ugly-looking fish called suchis, 8 to 10 inches long. I am inclined to give 13,000 to 14,000 feet of elevation above the sea to this place. In the hollows a few potatoes and quinoa (millet) are with difficulty grown, and there are some scanty pastures fed by occasional rains. The severity of the climate freezes the potato, and in this state it is called chuño, the starchy matter of the potato being changed into saccharine by the freezing. From the quinoa a fermented liquor is made. During the summer months pasture is found as high as 14,000 to 15,000 feet.

Near to Isluga, water-fowl, a few ostriches, plovers, and bisachas, are found; the puma is also seen, its prey being the young llamas: the condor is also dreaded. Of fuel, there is a little turf, the tola, a small resinous shrub, and the resinous yareta, a plant of a globular appearance, the resin exuding in winter.

*Pampa de Sal.*—To the E. of Isluga commences an extensive salt plain, said to extend to Challaputo and the insulated Cordillera del Frayle, 40 leagues distant, and near to Potosi, varying in breadth from 3 to 8 leagues, the salt being from 5 to 10 inches thick. From near Enquelca this salt plain is seen as far as the eye can reach, forming a regular white horizon, and in striking contrast with the dark lower parts of the Cordilleras. The elevation of this plain is at least 14,000 feet.

*Cariquima* is an estancia at the western base of the high mountain of Mama-Huanapa. There are other estancias, such as Xiquima, Turini, Chivullani, &c.

*Mauque*, W. S. W. of Isluga, is a small village, with a chapel larger than the whole place put together, and dedicated to our Lady of Guadalupe, who, it is said, appeared to an Indian woman on a hill a few hundred yards N. of the village, at which spot a large cross is erected.

*The Lake of Paríñas* is to the N. of Mauque, where there is much wild fowl and flamingos with red breasts.

*Puchultisa*.—From Mauque to this place a pass leads, which is lower than that of Pichuta. Here are a few huts for the accommodation of the Indian shepherds. A small stream runs by it, which is augmented by others from the boiling springs, water volcanos, or

*Volcancitos de Agua de Puchultisa*.—These lie in a hollow of the mountain, the surface of which is composed of a thick white crust. There are a dozen or more of these volcancitos, or geysers, from 3 to 5 feet in diameter, with water boiling at various levels, some throwing the water to 2 feet in height. The water as it cools leaves a sediment which increases the size of the cones. There are more than 500 smaller ones dispersed over the hollow, emitting a sulphureous odour, whilst a rumbling subterranean noise is continually heard like distant firing. May not the surface of this hollow be the covering of a comparatively quiescent crater, which, as the water runs into it from the mountains, gets heated, expands, and forms these Andean geysers?

*Quebrada de Biscachas* is a deep and rocky ravine, descending which towards evening I saw great numbers of biscachas. These are sometimes called the hare and rabbit of Peru, but are classed with the chinchilla family. The chinchilla burrows rather higher up on the Andes than the biscacha.

A mountainous route by Uimaga, round the base of Tata Jachura, leads to the large Indian town of *Chiapa*, 19° 32' 19" S., 69° 13' W. Here wheat, maize, potatoes, and vegetables are cultivated. In the month of June it freezes at night. The water used in the irrigation of the land is conveyed by aqueducts of some extent. One day's journey E. is the mountain of Quetani, where there are some old silver-mines worked in the time of the Incas. About Chiapa grow the cactus, tola, culen (*Cytisus arboreus*), jarillo (a *spartium*?), aracache, or wild celery (*Conium moschatum*), valerian, and a few wild flowers.

*Soga* is between Chiapa and Camina, by so mountainous and broken a track as to be called the Devil's road.

*Quebrada de Camarones*.—The boundary is a few miles N. of the ravine which rises in the Cordillera of Arica. The water in

this valley is brackish, and ague prevails in that part near the coast. Much black oxide of arsenic is found in this ravine.

*Chisa* is a small vineyard in the valley of the same name, in which is also *Minimñi*, an Indian town producing wheat and fruit.

*Ascent of the Mountain of Tata Jachura.*—I ascended this conical and beautiful mountain in the month of June, in company with my friend Mr. George Smith, with whom I had travelled over much of the province of Tarapaca. We left Chiapa at noon by ridges, stony *cuestas*, and in a mountain hollow at sundown camped for the night under the lee of some huge rocks. The following morning at sunrise it blew strongly from the E., and very cold. We travelled onwards as long as the rugged track would permit our animals to do so, when our Indian guides begged to be left behind in charge of them. To this we agreed, and continued the ascent. We were fast leaving the *cardon* below us, and the only plants seen were a little *ichu* pasture, stunted *tola* bushes, and the *yareta*.

Our ascent was over steep, sterile, broken, argillaceous rock, until we came upon thick ice. We bled a little at the nose, had an unpleasant singing in the ears, headache, dimness of the eyes, and the body benumbed with cold, caused by the *puna*, *soroche*, or cold and attenuated state of the atmosphere. However, at 1 P.M., after a painful and laborious struggle, we reached the summit, the last part of our ascent being over broken rock and ice, there being glaciers in a dell below us.

From observations subsequently made I give the elevation of this peak as 17,000 feet at least above the sea. It blew a piercing gale of wind from the E., and so cold was it that the water in a gourd was frozen, and a piece of roasted meat we had with us became as hard as a brick. Our fingers were so stiff with cold that we were scarcely able to use our instruments; there was not sufficient power in them to strike fire wherewith to light a cigar, and we could scarcely hear each other speak.

From the summit there was a glorious view of the Andes, many peaks of which appeared to be from 3000 to 7000 feet higher than *Tata Jachura*. The cloudless sky was of a dark indigo colour, and the icy peaks and ridges showed a bold and well-defined outline.

During our ascent we saw *guanaco*s, *vicuñas*, *biscachas*, *chinchillas*, and now and then a *condor* soaring majestically about its mountain home.

Our descent did not occupy much time; we soon regained our guides, and, entering *Chiapa* at sunset, we were received by the population, the bells of the church were set ringing, and a good supper awaited us, including the *callapurca* (this is a dish of

honour—a savoury stew kept hot by large heated pebbles put into it), and old oily chicha de maize, in honour of our having been the first, in all probability, who had ever gained the summit of Tata Jachura.

The eastern side of the province is in the Cordillera, and is very thinly inhabited, there being only here and there farms for breeding llamas.

*Indians of the Province of Tarapaca.*—The Indians are those called Aymarras, as speaking that language. The Quechua is spoken more to the N.E.

The Peruvian Indians may be said to be Christianized (with the exception of those, however, on the eastern slopes of Bolivia, who still preserve some of their ancient customs, among which is that of worshipping high mountains, and the rising sun).

They were ruled by their conquerors with the iron rod of power, political as well as ecclesiastical, and invariably failed whenever they tried to emancipate themselves from the Spaniards. The rebellion of 1780, under Tupac-amaro, however, put an end to the cruel *repartimientos*, or parcelling them out like so many beasts of burden, but in every other respect their miserable state was not ameliorated. Many Spaniards were killed in Tarapaca at that period, the Indians destroying particularly the churches and the curas. Since the separation of the South American colonies from Spain the position of the Indian has been better.

The Indians are of a brown colour, straight black hair, sparsely made, and may be called a small race of people. They have been so subdued that they now pass for an inoffensive and quiet race. They marry young, and polygamy is not known amongst them. The Indian is slow in his movements, but most patient and persevering, performing long journeys with troops of mules and asses laden with the produce of his land for sale, whilst the women remain at home, assisting in the cultivation of the soil, and in tending the herds of llamas, alpacas, and sheep.

At their homes they fare pretty well, living on llama meat, poultry, &c.; some have flour and vegetables, but their principal grain is maize, from which they make bread, and their favourite chicha, the merits of which they celebrate in song; but with a little toasted Indian corn and some coca they will travel for many days over the most desert countries. The coca is masticated with llucta or llipta, composed of an alkaline ash, generally mixed with boiled potato.

Their habitations are built of rough stone, with seldom more than one apartment, without windows; the fire in the centre of it, the smoke going out of the top. At the end of the apartment is an elevated part, on which they sleep on llama and sheep skins. Their cooking utensils consist of a few earthen pots and dishes,

and they manufacture the material for their clothing from the llama, alpaca, sheep wool, and cotton.

The dress of the men consists of a coarse cotton shirt, woollen breeches and jacket, stockings without feet to them, a large hat made of guanaco or vicuña wool, hide sandals. A long strip of cotton hangs loosely round the neck, and sometimes round the head and face, to protect those parts from the cold or the intense heat of the sun's rays. A faja, or waistband, of various colours, in which is the pouch containing the coca, and a coarse blue and red poncho, complete his attire.

The women wear a long cotton garment, over which is a woollen dress; then a long poncho, fastened on each side by a topos, viz. silver spoons, with the handles pointed, serving as pins; a long faja round the waist; then the lliclia, or female poncho, in which they carry their children behind them. They wear sandals, but seldom any covering on their heads; their necks are adorned by a gargantilla (necklace) of coloured beads, little crosses, and many diminutive silver spoons strung on.

Occasionally a few "Chirihuanos," who are Indians from the Yungas, visit Tarapaca. They are denominated the travelling doctors of Peru, in consequence of their ambulatory pharmacy, which is composed of remedies for every disease, viz. herbs, gums, resins, roots, charms of various sorts, including the loadstone; but perhaps the only useful one is the quinquina, or Peruvian bark.

*Description of Section I.*—At Pisagua much black granite is seen, traversed by veins of quartz. The beach is extensive, with a heavy surf beating on it, and its beds of shingle have the appearance of having been recently upheaved or raised. The deep ravines of Tiliviche and Camiña which traverse the Pampa de Tamarugal are composed of sand, silicious pebbles, rounded and angular masses of granite, sandstone, volcanic rocks, and much gypsum. From Yalamanta the section goes through the arid range to Cahuisa, leading to a broken undulating region where there is pasture. To the right is the high mountain of Mama Huta, and just below the pass of Pichuta even the vegetation of the resinous yareta ceases. The volcano of Isluga succeeds; then Carabaya, Tata Sabaya, then along the W. edge of the great Salt Plain to the volcano of Carangas. In this section are seen the primary and secondary rocks, stratified porphyries, and ultimately recent lavas.

*Description of Section II.*—This section commences at Punta Piedra, near Iquique, where granite in a state of decomposition is seen traversed by veins of quartz. Clay slate also occurs in this vicinity. Above these is hard sandstone, which, I presume, gives rise to much of the great accumulation of sand. We are much indebted to Darwin (*see his 'Geology of South America'*) for



our knowledge of the class of rocks constituting the mountains of the coast, which are principally porphyritic.

At the mines of Guantajaya (the Chiflones), and near the summit of the mountain, I examined a superficial layer called Manto, which is composed entirely of a fossil shelly deposit of broken valves of a *Gryphæa*.

Immediately beneath the Manto argillaceous limestone is met with; and, at the base of the mountain of Guantajaya, the panizo, a peculiar unconsolidated rock, is found, which contains the papas or insulated masses of silver, as well as fossil shells. Darwin has figured three, viz. *Terebratula inca*, *T. ænigma*, and *Lucina americana*.

My friend Mr. John Morris, on examining the fossil shells I obtained from the panizo, has named them as follows:—*Lucina excentrica*, a *Venus*, *Trigonia* (a cast), and a new *Lucina*, which he has called *L. Bollaerti*: shell somewhat orbicular, compressed, umbones not very prominent, marked with concentric laminar edges, with rather broad striated interspaces, a more orbicular shell than *L. excentrica*, with somewhat concentric markings, but wanting the fold of that species. The worn fragments of ammonites, probably *A. plicatiles*. Professor Forbes writes me that these fossils appear to belong to the oolitic period, and are probably from strata equivalent to that portion of the series including the Oxford and Kimmeridge clays. One fragment of an ammonite is undistinguishable from the *A. biplex*; other specimens of ammonites are either *biplex* or a nearly allied species: the remaining fossils are a cast of a *Trigonia*, very near *T. costata* of the Oxford clay; an *Astarte*, very near a British Kimmeridge clay species; and a *Venus*.

The word panizo comes from panezillo, one of the many terms in the Spanish language for a hill or mountain. Thus a mountain is said to have "buenos panizos:" that is, such colours seen about it from the exposure of edges of veins, which the eye of the miner or cateador easily detects, and leads him to believe there may be mineral matter there. The desert localities of Peru are favourable for such observations, as there is no vegetation to obstruct the view.

Having passed through the panizo, a very hard rock is met with of a basaltic formation, and associated with this is one of a silicious character, having an arborescent appearance. The whole of this district has been much disturbed by earthquakes and volcanic agency, dislocating rocks, causing fissures in them; and at Guantajaya there are two species of chorros or cross-courses—one similar to the panizo, as if formed by the action of water; the other of hard rock, and as if it had been injected into the fissures in a melting state.

Having traversed the coast-range, we reach the Pampa of Tamarugal, with its large deposits of nitrate of soda and other saline matters. There rise out of it some isolated silicious mountains; the principal ones are Challacollo and Challacocito. In the former I visited some silver-mines. Mr. Blake mentions that, in sinking a well on the W. border of the plain, after passing through marly soil, trachytic rock was met with, and then water at 30 feet; and, near the well of Almonte, the ground was pierced to a great depth without coming to water, when the following section presented itself: Saline matters on surface; marl and clay, 50 feet; coarse sand, 2; clay, 80; fine gravel, which terminated in a bed of coarse gravel and pebbles, mixed with large water-worn stones. In the arid range of mountains on the eastern border of the pampa there is much sand and sandstone, and thick beds of detritus; underneath these, in all probability, the rocks are of a similar composition as those of the coast-range. Next in succession is an elevated tract of country, broken by ravines, with much débris from the Andes, composed of volcanic breccias and conglomerates, including angular masses of feldspar and volcanic rocks. This tract is interesting as being the first from the coast on which pasture is met with, some brushwood, and large cactus. On the eastern part of this pasture-land high mountains are situated. This meridian may be designated as the commencement of the Andes or mountain-knot of Potosi.

Having ascended the Quebrada de Biscachas, we come to the water volcanos of Puchultisa, and crossing the pass of Manque there is a descent into the plain of Isluga, out of which rises the volcano of the same name; this elevated region presenting the appearance everywhere of volcanic formation.

A few miles now to the E. commences the great Andean salt plain, extending far towards the E.

In a line N. of Isluga is the high peak of Carabaya; then follow the more elevated ones to the E. of Tata Sabaya, Coypasa, and Cancosa, these peaks being on the boundary line of Tarapaca, on the other side of which the same Andean region extends far into Bolivia (Upper Peru); the whole forming an immense mountain-knot, and generally denominated the Cordillera Real de los Andes. The Indians speak of a "primera Cordillera" (a part of which is Sililica), but such must not be confounded with what is known as the Peruvian Andes of the coast, or the Bolivian Andes of the interior, but are rather isolated ridges.

*Description of Section III.*—I am informed that the coast-range here is similar to that of Iquique. After crossing the Pampa and the mountains E. of it, and arrived at the valley of Guatacondo, granite, clay-slate, porphyries, sandstones, and their débris are met with.

I have no personal knowledge respecting the mineral treasures of Ugina, the volcanos of Laguna and Olea, or the lakes and salinas of Coppa and Napo.

*Earthquakes.*—The inhabitants of Tarapaca expect a severe one every six or seven years, but few days pass without a shock being felt. In 1795 as many as forty shocks were experienced in one day. In 1818 a series of heavy shocks continued for fifteen days. "When the miners of Guantajaya left the town the ground opened, and clouds of dust were raised in the streets by the violence of the concussions." On one occasion I was at the bottom of a deep mine in Guantajaya, when I heard a faint rumbling, which rapidly increased, sounding like distant thunder, and then appeared to pass onwards; next followed a motion of an undulating sort in a horizontal direction, which shook down part of the slanting road leading to the mine.

*Route from Cobija to Coquimbo by the coast of the Desert of Atacama, with Observations on the Meteoric Iron of Atacama.*

On this trip I had two objects in view: the one to examine the coast of the desert of Atacama; the other to ascertain, if possible, the exact locality of the meteoric iron. I made the passage in an open boat from Cobija to Paposo, a tedious one of 12 days, having wind and current unfavourable; we were generally at anchor during the day, and rowing at night, assisted a little by the land-breeze.

*Cobija* is the only port of Bolivia, or Upper Peru, supplied with water from springs (s. g. 1-00205). To the N. are the improving copper-mines of Rosario and Mamiña.

*Guasimur.*—Silver veins are reported to have been met with here. Having crossed the great bay of Mejillones, I had an opportunity of witnessing the vast numbers of seals that inhabit the coast, a profitable trade being carried on in their skins. The appearance of the coast, to use the expression of my native companions, was "horrorosa;"—steep, naked, jagged, granitic, clay-slate and porphyritic rocks, 2000 to 3000 feet above the sea, with a heavy surf beating on them; the shrieks of seals and the noise of myriads of sea-birds, under a blistering sun, formed no cheering scene.

*La Chimba* is in the centre of the peninsula formed by Morro Mejillones and Morro Moreno, a few miles inland and in a desert. From what I have been able to learn of this spot, and the strong indications of gold ore found there, I am induced to think that this place merits a more careful examination. There is not even water there, but, with the constant traffic of steamers on the coast, water and provisions might without much difficulty be transported thither.

*Morro Jorje* is a favourite locality in the estimation of the cateadores, or mine-hunters. It is from 3000 to 4000 feet high, and in consequence of this elevation it collects and retains some dew, which collects in springs.

*Agua Busna* and *Agua Salada* are springs, and occasional fishing stations. At *El Cobre*, as its name implies, there is copper as well as *liga* (an ore of iron). Along the mountainous shore a tract may be seen in this region of "cuestas, barrancos, y mal pasos," expressions comprehending everything dreadful in the shape of terrible roads.

*Remiendas*, *Tragajente*, and *Botija* are caletas, or fishing coves, where during the season much congrio and tollo are taken, dried, and sent into the interior.

*Punta Plata*.—Here are some springs up in the mountain, where a little vegetation is seen. On the 12th day I arrived at the little settlement of

*Paposo*—situated at the base of the mountains, supplied with water from springs. A little rough pasture grows on the heights, and there are a few pear-trees. This is the principal rendezvous of the changos or fishermen of the coast, who barter dried congrio for clothing, flour, cacao, tobacco, &c. Here I was informed that if I lost no time I might come up in a day or two with a party going into Atacama, who were likely to give me some information relative to the meteoric iron about which I was interested. Passing the fishing coves of *Punta Grande*, *Cachinal*, and *Agua Dulce*, traversing the *Mal Paso*, a very dangerous and rocky spot, I came to *Hueso Parado*, which is the old acknowledged boundary between Peru and Chile; but since guano has been exported from the coast, the Chilenos appear to think that the boundary of their country is farther N. than *Paposo*. The frontier line is in  $25^{\circ} 23'$  S., which about  $1\frac{1}{2}$  miles from the shore is marked by a whale's jaw placed upright in the sand, and it is the general opinion that it had been placed there by the old Spanish boundary commissioners. Herrera places the boundary in  $26^{\circ}$  S.

At *Hueso Parado* I fell in with the party I had come after, but they were not going into Atacama. I continued my journey with them across the valley of *Briadal*, over the *Pampa de Cardones* to *Tapaderas*, where there is a little pasture, but no water. At *Cachinal* we found a spring; the rocks of the country are granitic, containing much felspar; salt is also in abundance.

In travelling from *Copiapo* to Atacama I left the road in order to proceed by *Peine* to *Toconao*, to examine the site of the meteoric iron which is found in the vicinity of the latter place, and the origin of which has been from time to time the subject of discussion; but I was so unfortunate as to lose my way in the attempt, and obliged in consequence to give it up.

I had, so far back as 1826, obtained a specimen of this iron, which I had no doubt was of meteoric origin; and whilst travelling as far S. as Mani, in the province of Tarapaca, in 1827, I learnt that there were two "iron-mines," one called *Peine*, the other *Huanaquero*, in the desert of Atacama, and that they were called "Reventasones," or burstings. This word fortified me in the belief that they were deposits of meteoric iron, the more particularly as I subsequently learnt that a person named Alejandro Chaves had heard a great noise in the vicinity of *Peine* in 1821, and that shortly afterwards large masses of iron were found scattered about the plain; also that an Indian, named Matico, and who lived near *Huanaquero*, knew the exact spot of the reventason there. The following route was given me to one of the iron-mines, and I was informed that iron was found in abundance in a mountain. This I suppose to be at *Toconao*. San Pedro de Atacama by Carabaya and Ylo to the iron-mine at *Toconao* is 22 leagues. It was this information that prompted me to essay crossing the desert when at Cachinal, in search of *Huanaquero* and *Peine*, in which I did not succeed. At Copiapo I got only little information on the matter; but at Coquimbo Monsieur C. Lambert corroborated much of what I had been informed in Peru, and mentioned to me that, in 1822, when he was on his journey from Atacama to Copiapo, and wished to be taken to the reventasones, the people of that part of the country would not show him the spots, supposing them to be silver. He afterwards procured some specimens from one or other of the reventasones, which proved to be meteoric iron: one of these he sent to England, and it is now in the British Museum, with a larger one presented by Sir Woodbine Parish. I have entered rather fully into this matter, as the positions have not as yet been visited by any scientific explorer, and the more so as it has been the subject of correspondence between Sir W. Parish and Humboldt: the former having been informed that the *Toconao* deposit had been found existing *as a vein*.\* *Toconao* is 10 leagues E. of San Pedro de Atacama, and at the foot of the Cordillera. I have given *Peine* as 30 miles S.W. of *Toconao*, and *Huanaquero* 50 miles S.S.W. of *Peine*. Supposing the Atacama meteorite to have come obliquely into our system, and to have burst after it had got into our atmosphere, the circuit of dispersion of its fragments would be elliptical rather than circular, and thus account, in some measure, for the masses having been thrown rather more N. and S. than E. and W. There is no account of the direction the meteorite came in, only that it was in the daytime, and with a noise. For the guidance of future travellers who may go in that

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\* See Buenos Ayres and La Plata, by Sir Woodbine Parish, K.C.H.

direction, I subjoin the following route from Copiapo to San Pedro de Atacama :—

Copiapo to Llampos . . . .	12 leagues
„ Pugios . . . .	3 „
„ Chañaral . . . .	10 „
„ Agua Dulce . . . .	9 „
„ Doña Inez . . . .	8 „
„ Encantada . . . .	5 „
„ Juncal bajo . . . .	4½ „
„ Chaco bajo . . . .	4½ „
„ Baquillas . . . .	2½ „
„ Aguas blancas . . . .	5½ „
„ Zorras . . . .	7 „
„ Pujios . . . .	9 „
„ Posos . . . .	9 „
„ Peine . . . .	3 „
„ Carabajal . . . .	8 „
„ San Pedro de Atacama . . . .	12 „

A “white metal,” called by the Indians *pampua*, is said to be found at Chala, or *Chaupiyunga*, N. of Santa Barbara; it is sometimes called *platina*, for on putting it into the fire it gets brighter. I strongly suspect this to be meteoric iron. There are two or three other spots to the N. of Chala, which, when examined, meteoric iron may be found there.

*Chala* (\*) is in 21° 54', 68° 50'; (\*) 21° 42', 68° 48'; (\*) 21° 35', 68° 45'; (\*) 21° 22', 68° 43', are other spots deserving of examination for meteoric iron.

Since the foregoing was read at the Royal Geographical Society, a communication has appeared in *Chambers's 'Edinburgh Journal,'* 375, March 8th, 1851, relative to this meteorite, or rather a collection of masses of such, by Dr. Reid, from which the following is extracted: “Four days and a half from Cobija is Calama; two days more is *Chuicchuic*, not far from which are the so famous meteorolites (stones supposed to have fallen from the air). It is my opinion that they are not meteorolites, but of volcanic origin. They were first discovered fifty years ago. At first they were thought to be silver, and the Indians made spurs of them.

“Those which have not been already collected are covered over by the drifting sand, and one must dig in order to get at them. With little trouble we may convince ourselves that a volcanic eruption once took place here, for the direction of a distinct vein can easily be followed. I have my compass with me, and find that these stones contain a large quantity of iron. The stones

\* See Map.

appear in 23° 30' S., and between 45 and 50 Spanish leagues from the coast." I put myself in communication with Mr. Bonar, of Ratisbon, a friend of Dr. Reid's, who kindly sent me a small specimen of the meteoric iron collected by Dr. Reid, which appears similar to that from Toconao, and who tells me that "the Indians have found pieces of 50 and 100 lbs. weight, which they use to make spear-heads, knives, &c. Humboldt speaks of these meteorolites: they lie on the ground in heaps, and bushelful are scattered about. Dr. Reid imagined them to be volcanic, as an extinct volcano is found some distance off." Humboldt is not of this opinion; and M. de Rivero, Consul-General of Peru, informs him that in 1829 he analyzed the meteorite of Atacama, and the results were as follows:—

Iron . . . .	90.40
Nickel . . . .	8.60
Residue . . . .	0.30
	99.30

This does not quite agree with Dr. Turner's analysis (viz., iron 93.4, nickel 6.681, cobalt 0.535), which was from the specimen presented by Sir Woodbine Parish to the British Museum. On reference to Arrowsmith's Map of La Plata, &c., the following are nearly the positions of the deposits of meteoric iron:—

	o / o /	
Toconao . . . .	23 20 S.	68 10 W.
Dr. Reid's . . . .	23 30	68 50
Peine . . . .	25 35	69 45
Huanaquero . . . .	24 30	68 50

NOTE.—Captain Thomas Steele, a Fellow of this Society, at present travelling through South America, has promised to investigate this interesting question.—ED.

### XI.—*Progress of the African Mission, consisting of Messrs. Richardson, Barth, and Overweg, to Central Africa.*

[Read January 13, March 24, and November 10, 1851.]

#### I.

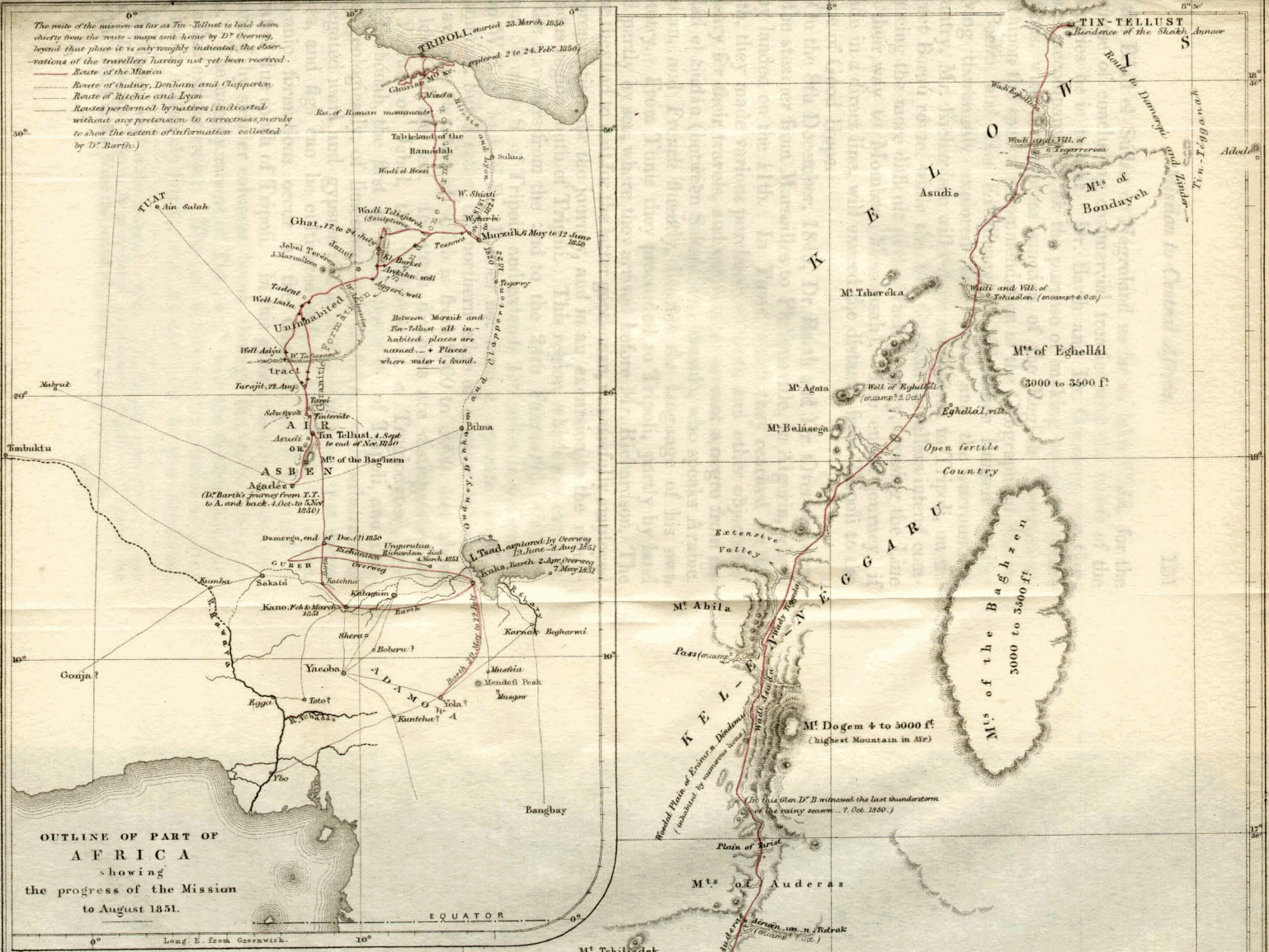
Communicated by Mr. A. Petermann.

THIS expedition is under the direction of Mr. James Richardson (well known from his travels in the northern portion of the Great Sahara in 1845 and 1846), who is directed by the English Government to proceed to Tripoli, and thence across the Sahara



The route of the mission as far as Tin-Tellust is laid down clearly from the route-maps sent home by Dr Overweg, beyond that place it is only roughly indicated, the observations of the travellers having not yet been received.

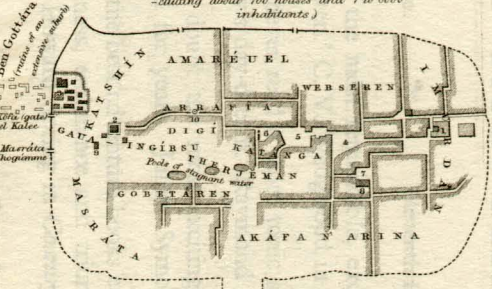
— Route of the Mission  
— Route of (Dunbar, Denham and Clapperton)  
— Route of Ritchie and Lyon  
— Routes performed by natives (indicated without any pretension to correctness, merely to show the extent of information collected by Dr Barth.)



OUTLINE OF PART OF AFRICA showing the progress of the Mission to August 1851.

**PLAN OF AGADÉZ.**

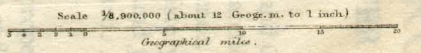
(The circuit of the town is 3 miles, including about 700 houses and 7 to 8000 inhabitants.)



1. House belonging to Annour, where Dr Barth was lodged.
2. The Medinet (a high watch tower) with the tamisgida bére or great mosque
5. The fada or haou bére, the palace of the Sultan
4. Kasua n' delletti or taiman leker (Vegetable market)
5. Kasua n' rikoma (Meat and Cattle market)
6. Katanga (Market for all other things)
7. Ennarir n' sikan (Camel market)
8. Mohammed Bero's house
10. Well called Sheduanka

**DR BARTH'S ROUTE FROM TIN-TELLUST TO AGADÉZ.**

Position of Tin-Tellust. Latitude fixed according to a dozen astronomical observations by Dr Overweg. Longitude according to 427 observations by Dr Barth. (The Meridian is not given but is unquestionably that of Ferro, 17° 40' W. of Greenwich, according to which latter the longitude has been reduced.) A.P.









to the Bilád el Súdán or Negroland as far as lake Chád, for the purpose of concluding commercial treaties with the chiefs of the countries he is to visit. Dr. Barth and Dr. Overweg, two Germans, accompany him for the purpose of making scientific observations, with the express sanction of the English Government, and upon the special recommendation of the Geographical Society at Berlin, and His Excellency the Chevalier Bunsen. After having thoroughly explored lake Chád and the surrounding country, Mr. Richardson will return northwards to Tripoli, on the direct Bornú route, while the two German travellers intend commencing the more difficult part of their journey, crossing the Line on their way to Mombas (Mombasah). The entire journey, if made in a direct line, will exceed the distance from Tripoli to the Cape of Good Hope.

On the 8th December, 1849, Dr. Barth and Dr. Overweg went in the steamer from Marseilles to Philippeville, in Algeria, where they landed on the 11th. In Tunis, which they reached on the 14th, they made various purchases of cloth and other objects necessary for their travels, and engaged as servant a negro from the Bilád el Súdán (between Sakatú and Bornú), who speaks Arabic, Italian, and French fluently, besides the language of his own country. From Tunis they proceeded to Tripoli, partly by land and partly by sea, where they arrived before Mr. Richardson. The time they had to wait for the latter gentleman, was usefully employed in preparations for the journey, and in an excursion to the mountainous region south of Tripoli. This region, which was explored by the travellers from the 2nd to the 24th February, 1850, lies about 50 miles S. of Tripoli, and extends 150 miles in a direction from W.S.W. to E.N.E. It does not form a separate range of mountains, but is rather the northern edge of a great tableland, the average elevation of which is from 2000 to 3000 feet above the level of the sea. Its three divisions are distinguished as the Yofrán or Jebel, the Gháriyán (*i. e.* Troglodytes), and the Tarhónah, the first of which lies S.W. of Tripoli, and consists, geologically, of limestone and sandstone, with substrata of variegated marl and gypsum; it is so dry and stony, that dates, olives, and figs can be cultivated only in the Wádís or valleys. Volcanic formations occur in the Gháriyán division, which is situated due south of Tripoli. In this group, basaltic cones, surmounted by slender columns, break through the white limestone hills. The mighty mount of Tekkurt,\* near the Gháriyán defile, has a fine extinct crater. The soil of this district consists of a rich red loam, extremely fertile, and covered with the most luxuriant

\* This Berber word is the name of a town in S. Algeria, spelt *Tegort* in our maps. *Tekkurt*, or *Tekurt*, is pronounced in Barbary *Tegurt* or *Tugurt*; the letter *káf* having in the West the sound of *g* in good, get, give, &c.—R.

plantations of olive-trees and saffron. It is in this rich loam that the inhabitants have dug their subterranean dwellings. The Tarhónah mountains, forming the third division, and lying S. E. of Tripoli, are lower than the preceding groups, and are characterized by the general cultivation of grain, and abundance of Roman remains.

Such is a brief outline of the general character of this region, a full account of which, by Dr. Barth, with a valuable map, has been sent home. It may also be added that an unexpected degree of cold was experienced in their excursion: on one day, the thermometer, before sunrise, stood as low as 26° Fahr., and on the 2nd and 3rd of February the snow obliged the travellers to remain in their tents. The winter seems to have been unusually severe for those countries. In Ghadámis, snow fell several times, and at Sukná, it came down in such quantities, that the inhabitants apprehended the destruction of their houses; even at Murzúk ice of the thickness of a finger was formed on small pools of water.

After their return to Tripoli, some more weeks were required for their preparations, and the transport of the boat for navigating lake Chád caused considerable difficulty. For this purpose, a beautiful wherry had been constructed by the direction of the Admiral at Malta, broad in the beam, and as light as a cork on water; but it was necessary to take it to pieces, and more than eight camels were requisite to convey it during a four months' journey across the burning sands of the Sahrá.

The party started, at last, on the 23rd March, 1850, the great caravan having departed before them; but the party formed a small caravan of itself, having about 40 camels, laden with their effects and merchandise. Another important servant had been secured by them at Tripoli, in the person of a trading Bagdermí negro, who has travelled from his native country to Tripoli several times, is acquainted with the principal merchants in Bornú, and, besides his mother tongue, speaks the languages of Bornú and Mandarah, the countries to be explored by the expedition. The greatest possible assistance was rendered by Her Majesty's Consuls in Tripoli and Murzúk to the undertaking, so that the expedition started under the most favourable circumstances.

The direction of the route to Murzúk was almost due south from Tripoli, beyond the Gháriyán defile, the country consisting of a continuous table-land, of an average elevation of 2000 feet. As far as the Well of Tabóniyah, many deep Wádís intersect this table-land, and the ruins of several Roman monuments and columns were discovered by the travellers. Southward of that place is a table-land or Hamádah, an immense desert of con-

siderably greater elevation, and extending for about 110 geographical miles in the same direction. As far as the eye can reach neither trees nor indications of wells are visible, and the scanty vegetation which occurs, is only found here and there in the trifling irregularities of the surface. The ground is covered with small stones, pyramids of which, erected with great labour, serve as road marks to the intrepid camel-drivers by day, while the Polar Star and Antares are their guides by night. After six long days' journey, the expedition reached the southern edge of this tableland, which descends in perpendicular walls to the Wádí el Hessí. Following the descent for about 60 geographical miles, the travellers came to the Wádí Shi'atí,\* over another plateau of equally dismal aspect. It is composed of a black sandstone, the disintegration of which forms a dark yellow sand, covering the inequalities of the stony surface, from which stands out prominently the black rock, in high cones of the most fantastic forms, strikingly representing basaltic rocks. They reached Murzúk† on the 6th of May, and remained there till the 12th, collecting much important information respecting the countries and nations to the south. Murzúk is very unhealthy and dangerous for Europeans, but happily none of the party suffered during their stay.

On the 12th of June they set off for Ghát, which they reached on the 17th of July. The most interesting result of this journey was the discovery of several curious sculptures on the rocks of the Wádí Felisjaréh. One of them consists of two human figures with the heads of birds and a bull, armed with spears, shields, and arrows, and fighting for a child; the other is a fine herd of oxen going to a watering place,—most skilfully grouped and executed. In the opinion of the travellers the two works bear a striking and unmistakable resemblance to the sculptures of Egypt. They are evidently of much higher antiquity than many other sculptured tablets found by the travellers, on which camels formed generally the principal objects.

The party started from Ghát after a stay of some days, for the kingdom of Air‡ or Asbén; they had to cross a vast desert, totally uninhabited for about 250 geographical miles, and succeeded in reaching Tarájit, the first inhabited place in Air, on the 22d

\* Shi'atí or Shiyatí; probably the former, which signifies split or divided.—R.

† Murzúk, an Arabic participle, is the name of the Bení Marzúk, a tribe which formerly dwelt there.—R.

‡ Perhaps *Háhir* in Leo Africanus (p. 10) and Ibn Baṭútaḥ (p. 45): the *Káhir* is the reading in Kosegarten's and M. de Slane's version (Jour. Asiat. 1843, p. 287). *Obs.* The aspirate in *Háhir* كاهير is hardly sounded at all: hence the travellers thought it was Air.—R. See Cooley's 'Negroland' for *Ahír* and *Kahir*.—ED.

Angust, where they intended to make some stay, as that country had never before been visited by Europeans.

From letters of a later date, since received, it appears that Mr. Richardson and his party, five days after the period last mentioned, had experienced repeated attacks from treacherous and fanatic Tawárik,\* their lives having been in great peril. On reaching the frontiers of the kingdom of Air they were surrounded and followed by large numbers of the Hagar-Tawárik,† on one occasion by as many as 100 armed men. After having escaped from these bands, with the loss of most of their goods, the inhabitants of Air also commenced hostilities, taking away all their camels. Some pious Mussulmans of Selufiyeh, however, fortunately took them under their protection, promising to see them safe to Tin-Tellust, the residence of the Emír, el Núr, Sheikh of the Kelowís, to whom the travellers were recommended.

## II. *First Letter from Dr. Barth to Dr. Beke.*

Communicated by Dr. Beke.

Tin-Tellust, 2nd October, 1850.

MY DEAR SIR,—You will, I suppose, have already heard of the various misfortunes that have befallen us on our way to this country, which, as it was never before visited by any European, except, perhaps, by Hornemann, could not be ventured into without great risk. Our difficulties, thank God! are over; and we have passed the last four weeks in tolerable security, though not in enjoyment of the liberty requisite for exploring Air, as we are detained like prisoners in this village, the residence of the powerful Sheikh-el-Núr, who has taken us under his protection.

The central position of this interesting country, however, has afforded us an opportunity of making very satisfactory inquiries about the surrounding desert, and we have been able to obtain very credible reports respecting the country itself, which was never supposed in Europe to be a territory containing more than a hundred villages. Mr. Richardson has forwarded the result of his inquiries to England, and I have sent mine to Berlin, reserving a short report, which I shall forward to your Government on my return from Agádéz, the Sultan's residence, which is about 150 English miles distant westwards from hence. I shall set out for that capital to-morrow, accompanied by an able and trustworthy relation of the Sheikh, and carry very little luggage.

\* Tawárik is the plural of Tarkí (the Tergates of Leo Africanus), pp. 10, 47, and seems to be a general name assumed by the Berbers in the shra. As the final consonants have always the surd, not the sonant, power, k (káf) regains its proper sound at the end of words.—R. According to Leo, the Tergates formed only one of five desert tribes.—Ed.

† Heggárs, Ibn Baṭṭah, Journ. Asiat., Mars 1843, p. 238.—R.

This journey, which it has been very difficult to perform, as well on account of the dangers on the road, as from the small provision allowed for our expenditure, will enable me to see some of the finest parts of Asbén, and will bring me into communication with the large tribes settled westwards, who command the road between this country and Sakatú. Besides which, Agadéz itself deserves to be visited, and we should certainly be deserving of much reproach if, after staying so long in Air, we did not even try to reach that capital.

The whole of the Great Desert, or *Ṣahrá*, will, I trust, assume a very different appearance in consequence of our researches; but it is not possible at present, when all our time is taken up in recording the result of our inquiries, to send to our friends in Europe more than very short notices of what we have learnt.

As such you must consider the-

1. *Route from Asiyú to Tuwát*, which I received from 'Abd-el-Kádir, an intelligent native of 'Ain-es-alláh,\* who had travelled by this road twice. A *káfilah*,† (*i. e.* party of travellers), lightly laden, can perform the journey, he says, in 25 days, but his subjoined itinerary gives 4).‡ All the horses used in Asbén are brought from Tuwát, with which much intercourse is kept up.

After a journey of four days the *káfilah* reaches the territory of the Imrát [Imghát?], a very predatory tribe, extending all the way between Tín tellust and Agadéz. Five days further on are the Plains of the Sakamarén, a branch of the *Ḥagará* possessed of large herds of cattle, and supplying a great part of Air with butter. The *Ḥagará*, who are at a considerable distance to the north of this road, are at enmity with their neighbours, so that there is an unoccupied tract of some days' journey between them.

Adjoining to the Sakamarén are the *Kél-emellel* (*i. e.* White Kél), closely united with the *Tawárik-el-baïlhá* (*i. e.* White Tarkahs) on account of their wearing a white dress, and the *Harar*; but the *Kél-emellel* are a branch of the Great *Kélowis* tribe. The *Kulúhet* are mixed with the *Kél-emellel*.

The *káfilah* leaving Asiyú for Tuwát reaches on the *first day* the Wádi, *Kél-súf* (Valley of Wool-Kéls), through which it passes for the *three following days* in a direction nearly due west, and on the fourth reaches the large *ghadír* (pool) of *Telelélt*, enclosed between two cliffs, where there is plenty of *Hashísh* [herbage] and

\* Saint's Spring, near the extremity of Tuwát, 27° 30' N. and 1° 3' E. of Greenwich, according to Major Laing, who was there in January, 1826.—R.

† *Káfilah* in Arabic = *Káráván* in Persian.—R.

‡ At 10' per diem = 400', and 25 days at 16' a-day = 400': a satisfactory approximation.—R.

§ *Kolluwí* in Hornemann, § 2 (i. 151, Langlès' French Version).—R.

Talhah [*acacia gummifera*]. Here all the water in the valley is collected together, and the ravine takes a southerly direction. From Telelélt the soil is on the first day, sandy; on the second, rocky; and at noon (dhohor) on the third day, the *káfilah* reaches Insenuwán, where water is collected in a narrow and deep reservoir hewn out of the rocks. Hashísh and the fersik-tree are plentiful here.

Continuing for two days along the same Wádí, the *káfilah* reaches the well el-Hajrah at al'ashá [8 h. P.M.], where water is found in hollows among the rocks above the valley.

At noon on the second day from el-Hajrah, the date-*káfilahs* stop at Está, where there is no water, and from that place descend for a considerable distance into a wide valley where there is hashísh, talhah, and fersik; and continuing in a westerly course, at the beginning of el *kéiláh* (the siesta) on the *third day* reach Teharáh, where water is found just beneath the surface of the ground.

The road then passes over uneven rocky ground, intersected by many irregular wádís, and on the *fourth day* water is found at Tenákhorrát, inclosed by very precipitous rocks.

The road here turns from a westerly to a northerly direction, the soil being still rocky, with much hashísh; and at the beginning of el *kéiláh* on the *fourth day*, the first well, called Arák, [*Salvadora Persica*,] is reached, in a large valley bearing that name. This is followed for two days, and at dhohor on the fourth the second watering-place, Arák, is found between high rocks.

At this station the *káfilah* quits the wádí, and, passing over an argillaceous, pebbly level, again comes near to the rocks at the hour of al'ashá on the *third day*, and halts at the watering place, El Terretimín, on the rocks near which, there are many drawings and inscriptions.

This is the beginning of the Wádí Agemamár, in which, at about 'Ashá, on the third day, the *first*, and on the sixth the *second* well bearing that name is reached.

These valleys are succeeded by a complete desert as far as Khaneg (Kháník) about moghreb (sunset) of the *third day*, where, at the foot of the distant rocks, hashísh is found.

Before *kéiláh* on the *third day*, constantly travelling between chains of mountains, the poor slaves reach El Sha'áb, where there is plenty of grass, but no water; nor is any found till they reach the well Hási el koweirah in the morning of the second day, where it is abundant, together with the hashísh called damarán, at the foot of a precipitous rock.

A desert, with rocks interspersed here and there, is then traversed, and on the morning of the *second day* the *káfilah* enters Tuwát.



## III.—Report on Agádéz by Dr. Barth.

Communicated through the Chevalier Bunsen, by Lord Palmerston.

In taking the road to the Bilád el-Súdán by way of Aír, never before visited by Europeans, the African mission had from the first, an intention of reaching, if possible, the town of Agádéz. From Leo Africanus, and more recently from the inquiries made by the traveller, Paul Lucas, Agádéz was known in Europe long before the name of the Kélowis, or even before the existence of the Tawárik had been discovered.

As soon, therefore, after our arrival as circumstances permitted, and the population of Aír had become more accustomed to see Europeans and Christians among them, I resolved to make an excursion from Tïn-Tellust, the residence of the Sheikh, el Núr, to Agádéz, and, having intimated my intention to Mr. Richardson, communicated with the Sheikh, in order to obtain his guaranty and the protection of a party of his people proceeding to Agádéz to witness the investiture of the new Sultan, Abd-el-Kádír.

El Núr, having received a present of the value of 117, consented, and the valiant Hamma, his son-in-law, was appointed to take me safe to Agádéz, to show me the place, and to conduct me back in safety. Mr. Richardson, who, according to the stipulation made between us, had promised to repay the value of the present made to El Núr, furnished me also with a present for the Sultan of Agádéz, consisting of a fine bérnus, an Egyptian shawl, and some other articles, when, taking with me a copy of the treaty drawn up by Mr. Richardson, in order, if possible, to get it signed by the Sultan, I started on the 4th of October for Agádéz.

On my journey to, as well as from, Tïn-Tellust, I took a more easterly road than the common one, which passes by Asodí and the Wadí Tellwa, touching this latter only in the Wadí Anderez, which, like all the larger and deeper Wadís in this mountainous and most interesting tract of country, where basaltic formations take the place of granite, is extremely rich in dúm-trees,\* and presents a really tropical character. In this part is found plenty of wild beasts, principally lions and wild boars, also gazels (including the larger species called mareiyah †), ostriches, and monkeys.

I was seven days in going and six in returning, and following up the road each way with the compass I was able to lay it down on the map most accurately. But reserving an extract of the itinerary and a map of the road for the appendix to the report on

\* Properly daum, often pronounced dóm. It is the forked palm—Crucifera Thebaica, not found farther N. than in the Sa'id or Upper Egypt. Its fruit is called Mokl by the Arabs.—R.

† One large species of antelope is called Mare'iyah, i. e. remarkable.—R.

the town of Agádéz, I will here only mention that I had already discovered from the reports of the people that it is wrongly placed in all our maps, being rather to the S.S.W. of Tín-Tellust.

When I arrived at Agádéz the investiture (*saráuta*) of the new Sultan had not taken place, and Abd-el-Kadír was still living in the private apartments of the palace (a group of about twenty houses situated towards the western end of the town, from which it is separated by a gate); in the Hausa language it is called "fádah." The same morning the Kélgerís, who had brought the Sultan from Sakatú, followed by their families, their immense flocks of camels and their cattle, left the place, and it was only after they had departed that I could enter the town with some security, in the company of the Kélowis.

Early in the morning after our arrival we paid our respects to the Sultan. Abd-el-Kadír, ben e'Sultán, Mohammed-el-Bakr, who had already before enjoyed that dignity during no less than twenty years, is a stout man of about fifty-five years of age, with large benevolent features, as far as the shawl wound round his head and face permitted one to judge. Sitting in a large room, supported by two short massive columns, and very simply dressed in a large white shirt, he received me most kindly, and seemed rather astonished that a person should pay him a visit, of whose nation he had scarcely heard mention, excepting in connection with gunpowder.

I delivered the presents intrusted to me by Mr. Richardson, and the letters from the Sheikh, el Núr, and assured the Sultan that, though I had come alone, I paid him also the respects of my companions. The treaty I could not with prudence mention in the presence of the Kélowis, nor did circumstances allow me afterwards to try to get the paper signed by him. Indeed the fact that the first European who ever visited this place, travelling as such, was well received not only by the authorities, but also by the people of the town, is a matter of really greater consequence than if by some intrigue or other (for it would scarcely have been possible otherwise) I should have succeeded in obtaining the signature of a paper which could be of no importance as long as the Sultan of Sakatú had not signed it. Agádéz being merely of importance to European commerce because it lies on the most direct road from the Mediterranean to Sakatú, it would have been interesting for one of us to have taken this road; but the losses we had suffered did not allow of it. The Sultan of Sakatú, whose authority as Emír-el-Mumenín is very great, having signed the contract, an English merchant, passing by Agádéz, will not have to pay more than an Arab, viz. four dollars for every camel-load. It is of great importance, and will make the name of the English respected through the whole road to the interior, that

the Sultan has severely punished those tribes which had attacked and plundered us, as I shall have occasion to mention hereafter.

The Sultan, who had not looked at the gifts in our presence, expressed his satisfaction immediately afterwards by sending me a fat ram, and henceforth he invariably sent dinner and supper every day, and most frequently a particular dish for myself made of corn, corn being regarded in this country as a princely dish. When the Sultan left for the *razzia* he had the kindness to send me provisions from his camp, in order that his guest might not be inhospitably treated during his absence.

The investiture of the Sultan did not take place until four days after our arrival, on the 16th of October, or the first day of the great Mussulman feast called by the Arabs "Id-el-Kebír," and in the Hausa language "Sallalajeh." Early in the morning the Sultan of the Kélowís, Astáfidet, who has his residence in Asodi, made his entrance at the head of about 400 of his people, which was but a small part of the force which he had collected together. They rode directly to the *fádah* or palace, where the ceremony was to take place, for which ten of the chief men of the Itésan and the Kelgerís had already arrived the day before.

Abd-el-Kadír was then conducted by the principal people of the three tribes mentioned, from his private apartment to the public one. The leaders of the Itésan and Kelgerís, who went in front, then begged him to sit down upon the *gadô*, a sort of couch made of the branches of the *dúm*-tree, similar to those used in Egypt, covered with mats and a carpet. Upon this the Sultan sat down, resting his feet on the ground, but he was not allowed to put them upon the *gadô*, or to make himself comfortable in the Oriental style, before the Kélowís asked him to do so. Such is the ceremony of the combination of these Tawárik tribes in the investiture of the Sultan.

Immediately after this ceremony was over, the religious one of the great Mahometan feast took place, the two being combined this time for greater splendour.

About half-past eight in the morning the procession, which I witnessed from the terrace of our house, left the *fádah*, taking its way through the southern part of the town, after which turning to the N. it went round the whole till it reached a place about a quarter of an hour to the W. of the town, where, near the tomb of a saint of no great fame, called Sidi Hamáda, there are some graves. On this spot, according to an ancient custom, the Sultan with all his suite has to pray on this great holiday of the Moslíms. The prayers being finished, the procession returned by the southern part of the town, and at about ten o'clock the different parties separated.

This ceremony or procession was very interesting, as it exhi-

bited a considerable number of Tawárik of different tribes in their best array. In front of all, accompanied by the musicians, rode the Sultan, enveloped, over his fine Sudan robe, in the blue bérnus the Englishman had brought him, which was admired by everybody as the most beautiful ever seen here; and these tribes were extremely pleased that a person should come from afar in order to present to their Sultan so fine a dress to be worn on the day of their great ceremony.

Next to the Sultan rode the two Serkí-n-Turáwas, after whom followed the Chiefs of the Itésan and Kélgerís, on horseback, in full dress and armour, with their swords, daggers, long spears, and immense shields; then came the longer train of the Kélowís, mostly on Meherís, with their Sultan, Astáfidet, at their head, and last of all came the people of the town. Indeed the whole recalled the chivalrous processions of the middle ages, the more so as the high cap of the Tawárik, enveloped by a profusion of tassels on every side, together with the black nedí, which covers the whole face, leaving but the eyes visible, and the shawls wound round the head, quite partake of the character of the helmet, while the glittering black robes, over which on such a day the principal people wear a red bérnus thrown over their shoulders, very well represent the heavier dress of the knights of yore.

Immediately after this ceremony was over the people deliberated respecting an expedition—"razzia" in Arabic, "jaki" in Haussa—to be undertaken against the Avelimmiden,\* or, more properly, the Meharebín or freebooters; and councils of the chiefs and the Sultan were also held. A great Maraboot, Sidi R'alli el Háj Annur, whom I shall mention afterwards, had made peace between the Kélowís and the Kélgerís, and they agreed to act in common. Amongst a warlike people like the Tawárik, expeditions of such a kind do not require long preparations; and after a herald of the Sultan had proclaimed through the streets on the 19th the order of his master, that nobody should proceed on the road to Damergú, Abd-el-Kadír departed on the evening of the 21st with about 700 men, among whom were 100 cavalry. Instead, however, of proceeding southwards, as the proclamation intimated, he marched North, encamping on the first night not far from the town; for it had been deemed more prudent to put down first the roving spirit of the people to the north, and to punish the freebooters of the Imrat, the Ikéskisan, and particularly those of the tribes on the northern frontier of Aír, who had done so much mischief to our mission, viz. the Tedé, the Kél-fedé, the Kél-hagar, and the Kel-razar. The Sultan and his council had been in a state of great anxiety, fearing that the Avelimmiden, a

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\* Also denominated by the Arabs "Muláthimmín" (veiled).—R.

most powerful tribe, and, as I shall afterwards show, identical with the *Sorgú*, or *Serkiú-Tawárik*, might join with the tribes to the north. The Sultan re-entered *Agádéz*, however, on the 7th of this month, and we had the satisfaction to learn that even the highest men amongst the tribes which had taken away our property had not been spared, and that the Sultan had taken nine camels from the person who had deprived me of my *Meheri*.

As soon as I had learnt that the Sultan was about to leave, I urged *Hamma*, under whose protection I was staying, to suggest to him that a letter might be written to Her Majesty, in which the Sultan should express his satisfaction that an Englishman had visited him and brought him presents in her name. This, at first, had been represented by *Hamma* as possible, but had become rather difficult, the Sultan being always accompanied by the different people that had arrived, besides which, in his peculiar position, he could scarcely venture openly to write to a Christian monarch. I was not able to obtain a second interview with him, but on the morning of his departure, when he was sitting in the courtyard of the *fádah*, surrounded by a great many people, I thanked him for the kindness and particular attention he had shown me, mentioning at the same time the letter to the Government in whose service I was travelling.\* The Sultan at once turned the conversation in a very amiable manner to letters of recommendation to his friends, the authorities in *Súdan*, and after my return to my quarters, *Hamma* brought me three letters, in which the Sultan had recommended me as his guest to the Governors of *Kanú*, *Kashnah*, and *Daurah* (a place between *Zender* and *Kanú*), and acquainted me at the same time that he himself had received a letter from the Sultan for the *Sheikh el Núr*, under whose protection and amongst whose people I had been.

As the people of *El Núr* were not able to buy provisions enough in the market, I did not leave the town until ten days after the Sultan had started for the expedition, when the town had become quiet. During this time, as well as while *Abd-el-Kadí*r was at *Agádéz*, I received visits from many persons, the most considerable among whom were the nephew of the Sultan, *El Kálek*, as well as the son of the *Kadí*, who visited me twice; also the former *Serki-n-Turawa*, *Mohammed Boro*, and a very enlightened *Mohammedan*, *Ma'llem* (or Doctor of the Law) *Háj Mohammed Omar*, who called upon me several times, conversing freely respecting the difference between the *Moslim* creed and that of the *Christians*, and finally asked for a copy of the *Gospel* in *Arabic*. Besides these I had interviews with two principal

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\* See the letter of the Sultan, p. 190.

men of the Itésán, who, in passing by the house where I lodged, saluted me in a most friendly manner, shaking hands with me from horseback, and assuring me of their friendship, as they were on their way to join the Emír, el-Múmenín (Commander of the Faithful).

Besides the ceremony of the investiture, and the expedition, the most interesting circumstance which took place during my residence in Agádéz was the passing of the immense salt caravan of the Kelgerís, which arrived on the 17th and started the next day on its road to Bilmah, and which was said to consist of not less than 10,000 camels.

#### *Account of Agádéz.*

Agádéz.\* or as the Tawárik call it, Ékadé, is situated on a Hamadah, or high plain, consisting of sandstone, and, at least near its extremity, of granite covered with small pebbles, which towards the north and east is very narrow, but becomes wider towards the west and south. On this plain, which, though containing no arable soil, furnishes a good deal of herbage and wood in its slight but wide depressions, the town of Agádéz is built. The Wadís, or valleys, which constitute all the inhabitable ground of Asben or Air, do not furnish room for a large place, all the dwelling-places, which are scattered over the country, being mere villages, with the exception of Asodí, which was in former times a place of importance. But while Asodí seems to have been once the real central point of all the country of Asben, Agádéz from the first, as is quite clear from its situation, was intended as a sort of rendezvous between the Kélowís and the tribes which inhabit the districts to the south and west. No author, as far as I know, has mentioned this place before Leo Africanus, in whose time it was most flourishing.

There are traditions among the inhabitants of the place, and particularly among the merchants from Tuwát and Ghadáms, according to which it is most probable, that though Agádéz was not founded, it became at least more important, and grew into a considerable town, by the arrival of the sections of several tribes from the north. These tribes are called Arabs; but there is no doubt that they belonged to the Berber race, converted already to Islam, and influenced by the civilization of the Arabs.

The settlement of these tribes in a place like Agádéz, which from natural reasons is the great central point for the commerce of all this part of the interior of Africa, is perhaps of greater

\* The correct spelling is evidently Ákadáz, or Ákadás, pronounced Egadéz. The Tawárik drop the final letter.—R.

interest than any other, excepting that of the Mesrátah, who belonged to the three most important commercial places of Northern Africa. viz. to Tuwát, Ghadámís, and Aujíla.

To Tuwát belonged the Gurára, a tribe intimately connected with the Berber race, which, till our days, has preserved a particular language or retána of its own, called el Zenatíyeh,\* very similar to the Tawárik.

From Ghadámís two tribes have settled in Agádéz, the Tésko and the Beni Uzíth, and, as in former times there was a well in Agádéz, called Ghádámís, so the Tésko have given their name to a well still in use. The Tésko consisted of two families or feias, viz. the Beni Darár, and the Beni Maziár, while the Beni Uzíth were divided into four feias, viz. the Tangazen, the Tefarfara, the Yeresan, and the Auelád Belil. (The Tésko at present do not constitute a part of the inhabitants of Ghadámís, having retired long ago to Beniolid.) Besides these two tribes, there were settled in Agádéz the Aujíla, a section of the inhabitants of the oasis of that name, who are still among the most enterprising travellers and merchants of the desert, and the Mesrátah (inhabiting a group of more than forty villages, four days' journey east of Tripoli, and called by Europeans Mesrátah, the remnant of the once powerful tribe of that name), who formerly possessed the fourth quarter of Agádéz. The inhabitants do not, like the merchants of the other towns, pay any tribute or móddah to any Tawárik chief for his protection on their journeys to the Sudan. The memory of the residence of this tribe in Agádéz is still living and attached to several localities of the town. Almost all the other gates are in ruins and are scarcely traceable, but the small gate which has received its name from this tribe is still existing in the western part of the wall; a cistern also (which I shall mention hereafter) is still called Mesrátah, and to the north of the town there is a well named after the Ben-Gúmmas, one of the three divisions of the Mesrátah, the names of the two others being Bu-Tárah, and the Ben-Gottárah, who lived outside the wall to the west, where the ruins of an extensive suburb are now seen.

Together with these tribes, of whose history we know something, there were settled in Agádéz, the Tafimatah,† a tribe whose origin I have not been able to trace.

As tradition does not say when those tribes settled in Agádéz, it is also silent respecting the period when they left the town, but it has preserved a curious fact, viz. that when these Arabs, as they are with some justice styled, and as the Arab formation of

\* The Zenata were a principal tribe of the Berber race.—Ed.

† This name resembles *Tufínek*, the name given by the Berbers to their remarkable and very ancient written character.—R.

some of the names shows, left the place, they had 500 jekbfa or cages, in which the wealthier Arabs carry their favourite women on their journeys, with them.

The account of the settlement of the Arabs in Agádéz is confirmed by Leo Africanus, who, though he calls the people of Agádéz "Negroes," yet describes their manners as very similar to those of the Arabs.\* That the Arabs left the place long before Leo (who did not visit Agádéz himself) wrote his description of Africa (1517), has been confirmed to me by the Mallem Háj Mohammed Omar, who, when I questioned him concerning the period when the town became so deserted as it now is, informed me, that it first declined from its happiest state about 400 years ago, when a great number of its inhabitants left the place.

There can be scarcely a doubt that it was either the Tawárik or the older inhabitants of Agádéz, or of a neighbouring place, who drove away the Arabs; for there is a very old tradition, according to which the present inhabitants of the town came from a celebrated valley, called Irín Allem, about a day's journey from Agádéz to the north, where they are said to have lived before; and I was assured by the Tuwátí, Abd-Allah, that the ruins of some houses are still to be seen in that valley, as well as two solitary date-trees bearing fruit, a very rare thing in this country, where, as far as I know, there are no date-trees except in a very few places, such as Iferuán and Chimmia. There is another tradition, according to which the Itésan were the eldest inhabitants of the place, from whom the present inhabitants are descended by an intermixture with slaves.

*The Emghedésé* (or Emkedésf) *Language*.—There is, no doubt, a good deal of slave blood among the present inhabitants of Agádéz, as is the case with the whole population of the south-eastern part of Afr, and principally in Tín-Téllust, but there must have been a very ancient stock of indigenous black people, who have transmitted from age to age a peculiar language of their own, "the Emghedésé," not a mere dialect of the Tarkí, or the Berber, or of the Haussa language, but a peculiar idiom, which is THE SAME LANGUAGE AS THAT SPOKEN BY THE PEOPLE OF TIMBUKTÚ and of the eastern part of Bambarrah. So all, among whom were several Tuwátí, who had been in Timbuktú informed me, and the correspondence of the four first of the numerals (for the people of Agádéz do not count farther in their own language) and that of some other words with those published in the Annals of Oriental Literature, as cited by Prichard in his Researches into the History of Mankind, show that they are correct. There is in addition a curious resemblance between the language of the

\* Leo distinctly says that many of the inhabitants were foreign merchants.—R.



people of Agádéz and that of the people of Timbuktú, which I will mention here, as it struck me with surprise.

The Sorgú-Tawárik, who have become known in Europe from the quarter of the Niger, are unknown among the Tawárik on this side and among the people of Air, and every one smiled at me as often as I inquired respecting the Sorgú or Sergú. On the contrary, every one knew the large and powerful tribe of the Avelimmiden. I was thus quite at a loss respecting the Sergú, when, on having placed among the phrases to be translated in the Emghedesfe language—"where do the Avelimmiden reside?" all at once, instead of the Avelimmiden, mention was made of the Sorgú or Sergú; and I now learnt that the people of Agádéz, and they alone of all the people round them, call the Avelimmiden by this name. I observed, also, in the course of my researches, that they call the language of the Tawárik in general, which is known under the name of Temázight, by the particular name of Sergiúneki. This fact, viz. the identity of the language of Agádéz with that of the language of the eastern part of Bambarrah, is of the greatest ethnological interest, as it seems to prove that the people of Agádéz are of the same stock as the people of Bambarrah, and are perhaps the remains of a great people, which in ancient times, before the Tawárik appeared, occupied all this tract of country. It seems at the same time that this district, and probably also the town of Agádéz itself, was inhabited from a very remote period by a peculiar people. Indeed all my inquiries whether any tribe or the people of any town round about Agádéz spoke the same language, were answered in the negative, till at length I was assured by a traveller that in a part of Adár the same language is spoken.\*

It is scarcely probable that the people of Agádéz should have changed their language from a mere intercourse with Timbuktú, even if such was, as it seems to have been, a most important one, inasmuch so that Agádéz became itself one of the first markets for gold, and had its own standard of this precious metal. It is odd that according to Leo Africanus the language of the people of Agádéz and that of Timbuktú were in his time quite different; for while in Timbuktú and the adjacent countries the *Sungai* language,† which most probably is identical with the idiom of Bambarrah, was spoken, he says that the people of Agádéz used the language of Gober. One might as well say now that the Haussa language, which seems to be identical with what Leo

\* The Bambarah language is a Mandingo dialect; and Dr. Barth means probably that the Kíssúr (the language of Timbuktú) is spoken to the east of Bambarrah.—Ed.

† For the identity of the Kíssúr, Songhai, and Timbuktú vocabularies, see Mr. W. B. Hodgson, of New York, on the same.—Ed.

calls the language of Gober, is the idiom spoken in Agádéz; Hausa being still at present the language of commerce and of intercourse between the different tribes.

Agádéz in former ages must have been a considerable and wealthy place, containing not less than from 50,000 to 60,000 inhabitants, the circuit of the whole town being about three miles. I was assured by the Tuváti, one of whom had been at Timbuktú seven times, that it was without comparison larger than that celebrated place. Indeed it must have contained from 20,000 to 30,000 inhabitants as late as the beginning of this century, when, as I learned from the Mallem Háj Mohammed Omar, the greatest part of the inhabitants left the town, scattering themselves over the towns and villages of Hausa, where living is cheaper.

At present the appearance of the town is that of an almost ruined and deserted place. Scarcely the sixth part of it is inhabited, the whole south quarter being entirely deserted, and in the northern part there is a much greater number of ruined houses than of inhabited. In my note to my colleagues, after a three days' stay in Agádéz, I estimated their number at not more than 400. But after considerable investigation, and after many inquiries, I am sure that I am not very wrong when I now estimate the number of inhabited houses at about 700. The houses are generally spacious, and all those which I visited contain from ten to fifteen inhabitants, so that the number of inhabitants, including both sexes and all ages, may be from 7000 to 8000.

*Commerce.*—The inhabitants are at present, as in the time of Leo Africanus, partly merchants and partly artisans. The merchants seem only to visit the markets of Kashnah, Tásawah, Marádeh, Kanú, and Sakatú, in all which places countrymen of theirs are settled; but, as far as I learned, they never go to the northern markets of Ghát or Murzuk, unless on a journey to Mecca, which several of them have made. As for the commerce with Timbuktú, all the intercourse with that place has now so completely been destroyed, that although I took all the pains possible, I was not able to get the itinerary of this interesting route, and I was assured by several that there was but one man, of a very advanced age, who knew it, and that he was absent. The road from Agádéz to Mabruk is no longer used for commercial purposes, but is infested by freebooting parties of the Kélferowán from the route between Tuvát and Timbuktú.

The commerce of Agádéz itself is nothing but a speculation in provisions, principally in ghussub\* or kasab (millet), which constitutes the principal and almost the only food of the inhabitants, as well in Hausa as in the country of Aír. When a caravan arrives

\* Ghussub, in imitation of Denman, &c. Kasab is a generic term, signifying "reed," or "grain."—R.

from Damergú, from whence all Air is supplied, the merchants buy a large quantity at a low price, and keep it till it becomes dearer, when they retail it in smaller parcels. But there being no coin in the market (unless the strips of cotton called "kebbekah" be regarded as such), all the buying and selling is done by exchange, the principal objects with which people barter being "tourkédi" (the dark-coloured cotton for female clothing made in Súdan); the fine Egyptian coloured leather, called kornu, which they use for the ornamental parts of their sandals, and of their leather work; mahmúdí, or English calico; zubaetas, or white shawls, which the wealthier people wind round their heads; cloves, pepper, pearls, etc. With these objects everything may be bought in the market of Agádéz, from the most valuable camel down to a pound of meat, or a small cheese, though ghussub, which in general is cheaper here than in T'ín-tellust, is the standard currency of the market. The mithkál (3 dwt.), which is equal to 1000 kerdí (kauris),\* of which at present 2500 make an Austrian dollar, being a mere nominal sort of money, according to which the value of things is estimated. Cowries (kauris) have no currency in the place; while of the kebbekah, which I have mentioned above, eight kámah or dhirá (cubits) make one rijal, and ten rijal or erjél are equal to one mithkál.

*Manufactures.*—The manufactures are very limited, consisting merely in leather-work and mats. With leather-work several classes of artisans are occupied, the shoe—or rather sandal-makers, the saddlers, and those who make leather bags and other things of a similar kind—the latter class consisting merely of women. The sandals are as far famed as the saddles, particularly those for mounting the meheris or swift camels, and are called rakhla in Arabic, kígi in Temáhirgh,† and sírdi in Hausa; the other leather-work made by the women is also very neat. All these things as well as the mats, which are of different kinds from the coarser up to very handsome sorts of different colours, are made in the houses themselves, there being at present no shops in the town, though the ruins of the houses prove that in former times there have been some on the north side of the market, called Katánga. Even this part of the town, the most frequented and important, where the three market-places are, is now surrounded with ruins of houses, on whose tops vultures watch the whole day for their prey.

The three market-places lying almost in the centre of the town and on the southern limit of the quarter, which is now most inhabited, are as follows, proceeding from east to west: the Kagwah n'délti, or the market of vegetables; then the Kagwah

\* Two-fifths of an Austrian dollar, or 20d. of our money.—R.

† Perhaps Temazight, i.e. Nobles.—R.

narahóma, where it appears that formerly the camels were sold, but which is now the place for selling meat and cattle, while the camels at present are sold on the small place before Mohammed Boro's house, called Enrárar en zákan; and the third market, called Katánga, where all other things are sold.

These markets are very poor, and were particularly so when I visited the place, all things excepting provisions fetching a very low price. English calico of very good quality was sold at 20 per cent. less than it had been bought for at Murzúk, while on other things the loss was still more considerable. Indeed Agádéz is in no respect a place of resort for merchants, not even Arab, while, for Europe, its only importance consists in its being the most direct road to Sakatú and that part of the Súdán. I add here the prices of different objects, as they were sold in the market during my residence in the place, remarking, at the same time, that the price of things is very different accordingly as you exchange them for other objects, or if you buy ghussub.

	Mithkál.	Rijal.
Ghussub, or Gafulí,* twenty sékkah (the sékkah of Agádéz being double as large as that used in Tíntéllust)	1	
Rice, ten sékkah	1	
Camel, a young one two years old, not yet fit for carrying things	18	
Ditto, a full grown	25	
Horse, a good strong horse	100	
Ditto, a fine one	1000	
Ass	6-8	
Ox	8	
Calf	4	
Ram	1	5
Sandals, a pair of common ones	0	1
Ditto, a pair of fine ones	0	5
Camel saddle, or Rakhla, a fine one	10	
Ditto, a common one	5	
Leather bag, of coloured leather	1	
Mat, a fine coloured one	0	6
English calico, ten dhira' or kámah	1	
Zubaeta	1	
Kornu, or the fine Egyptian leather, the piece	1	
Tourkedí, of common workmanship	2	
Ditto, of finer workmanship	3-5	

*Government.*—The authority of the Sultan (Amanókál in Temáhirgh; babán serkí in Haussa; kókeu in the Emghedesíe language) is not at all limited to the walls of the town, but is rather greater outside than inside of it. As far as I could make out, he does not receive any tax or tribute from the inhabitants, but his only income (besides the presents sent him on his investiture, and on other occasions, and besides a portion of the camels

\* Káfulí is another kind of grain.—R.

and flocks taken from freebooters, and other persons of that sort) seems to arise from levying a duty of ten mithkáls on every camel-load of merchandise that is brought into the town, provisions being excepted.

He is, in reality, the Sultan of several Tawárik tribes, whose union according to agreement is represented in him, and in the whole of his investiture the inhabitants of Agádéz have not a word to say. The Itésán and the Kélgeris take him from Sakatú to Agádéz, where he is met by the chiefs of the Kelowís, particularly by the Sheikh El Núr, or a person representing him, who, if they are pleased with him, make him Sultan. He must be taken always from one family, whose origin, as the people say, is from Stámbúl. Therefore, when the present Sultan, 'Abd el Kadír, ben e' Sultán, Mohammed el Bákrí, after he had been Sultan for many years, was deposed, on account of dissensions between the different tribes, in the month of Ramadán, 1265 (March of last year),\* the Itésán and Kélgeris sought, or rather had already sought his relative, Hámed el Arjáu, who was made Sultan. All the chiefs not being satisfied with the new Sultan, another member of the same family, of the name of Makita, or Imketen, living at Damergú, was elected Sultan by the dissentients. In consequence of this disagreement, which was near causing a war between the different tribes, the whole country was thrown into a state of the greatest confusion, of which the Aulád Suleimán (Children of Solomon) took advantage, which partly was the cause of the disasters under which our party had suffered. But the more prudent chiefs recurred once more to Abd el Kadír, who is considered by the people to be the best of the family, and made him Sultan a second time. During my stay in the place he imprisoned for some days three chiefs of the Itésán, who had arrived from Damergú in order to protest against him on the part of Makita. Limited as may appear the power of the Sultan, and dependent as he is upon the chief leaders of the Tawárik, *he has not only the right to imprison, but even to take life.* Neither the Sultan of the Kelowís, nor that of the Itésán, nor anybody else has the right to punish a person with death, but is merely authorised to seize him and to bring him before the Sultan, who, if he is found guilty, orders him to be beheaded outside of the town a little to the N.W., on a place called Azarmádarang. The Sultan, likewise, is said to have a frightful dungeon, where, as I was told, the guilty are thrown upon swords stuck upright in the ground. At present he is traversing the country, waging war with and punishing the tribes that have troubled the country and in-

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\* As 1265 began 27th of November, 1848, Ramadán, which is the 9th month, began about the 21st of July, 1849, and corresponded with August rather than March.—R.

fested the roads by their plundering excursions. Almost all the principal persons of the country accompanied him, among whom is the Chief of the Kelowís himself. The encampment of the army, which consists of about 3000 people, has no one central point, viz. the tent of the Sultan of Agádéz, but there are *two separate encampments*. While Abd el Kadir is surrounded by the Kélgerís, the Itésan, the Kélferwán, and the people of his town, the Kélowís are encamped round the spot where their own particular Sultan, Astáfidet, dismounted. No one appears to have a tent except the Sultan of Agádéz, who has one of a grey colour, but in other respects similar to those of the Turkish Agas.

The court is formed by a number of servants or slaves, by some musicians, and by a sort of aides-de-camp called fadawa'n serkí, viz. the sons of the former Serkí-n-Túrawa, or Minister, Mohammed Boro, but he has no Wexír; unless this title be given to the Serkí-n-Túrawa. No doubt the Serkí-n-Túrawa\* is the first person in Agádéz after the Sultan, but it was long before I was able to make out what were the real duties of his office, though the former Serkí-n-Túrawa, Mohammed Boro, had been our travelling companion on our journey from Murzuk to this country; unfortunately circumstances had not allowed me to secure at first the friendship of this respected person.

After many inquiries I learnt that the Serkí-n-Túrawa was properly the superintendent of the Arabs visiting the place, and I have no doubt that his office dates from a very remote period, when whole quarters of the town were inhabited by Arabs or by Berbers, already influenced by Arab civilization, and no doubt his office must have been of the greatest importance. At present his office with regard to the Arabs has become quite a secondary one. He has nothing else to do with the few Arabs, principally Tuwátís, who still visit Agádéz, sometimes staying there two or three years, but to levy the tax on their merchandise, and to bring it to the Sultan, who, according to custom, gives him a small portion of it. On the contrary, the other part of the duty of Serkí-n-Túrawa, which has reference to the Tawárik, is at present of much greater importance, for he has to accompany the large salt caravan of the Kélgerís, which annually supplies Western Sudán with the salt of Bilmah, from Agádéz to Sakatú, for which he receives one kantú, that is to say the eighth part (eight kantú weighing three Turkish kantars or quintals) of every camel-load, which forms a considerable income; the caravan consisting generally of some thousand camels, and the kantú of salt fetching in Sudán from two to three dollars.†

\* Serkí-n-Túrawa, Chief of the Fulani. Turawa in Haussa = a Fulan.—Ed.

† His annual income can thus amount to 20,000 or 25,000 dollars.—R.

After having brought the salt caravan to Sakatú, the Serkí-n-Túrawa annually has to go to Kanú, where he receives a small portion of the 600 cowries, or duty levied on each slave brought to the slave-market, after which he returns to Agádéz with the Kélgerís that have frequented the market of Kanú. This long annual journey, which brings the Serkí-n-Túrawa much more in connection with the Tawárik than with the Arabs, makes him at the same time a sort of intermediary between Agádéz and Sakatú. The former Serkí-n-Túrawa, Mohammed Boro, was a native of Sakatú, where he has a house as well as in Agádéz, Kanú, and Zinder. The present Serkí-n-Túrawa, whose name is Ashu, is, as I was told, very rich.

All the civil cases which do not come under the jurisdiction of the Serkí-n-Túrawa are brought before *the Kádí*, who immediately upon hearing the parties gives his decision. I was twice present when an affair of some importance in dispute between my companions the Kelowís and a man from the town was brought before him, which was decided in favour of the latter. The Kádí resides near to the great mosque, which is under his control.

Besides the Kádí, one of the principal men of the town seems to be the respected Mallem Sidí Ghallí el Háj el Núr, but what are his functions I could not learn.

*Schools.*—There are five or six schools in Agádéz, where the boys learn reading and writing the Korán; nevertheless there are but few persons here who understand Arabic.

*Morals.*—The women seem to enjoy great freedom, of which they appeared to make full use, particularly after the Sultan had departed. Some of them are pretty, and have Arab features, and among the men, I observed fine northern faces and good figures. The population is so mixed that it would be difficult to make out the type of the original stock.

The names of different quarters are still preserved, and are as follows:—Katángha, Gawa Ingírsou, Tafimata, Katiú, Kaswa, Ikenfeia, Amourfeuel, Imurdán, and Refía; but besides Kaswa and Katángha (the markets), whose position I have mentioned before, I could not define their exact position. The extensive southern part of the town is quite deserted, and is separated in most parts from the northern quarter by an open irregular space, where there are three pools of stagnant water, called Digí, Therjemán (most probably so called from the interpreters, who in former times had there their quarters)—and the third, Mesrátah.

The whole town being entirely on a level, with the exception of five or six small hills formed in course of time by the rubbish, there is a view from every terrace over the town, so that I was able to

make a sketch of the western part from the terrace of our house, which I used to frequent daily for one or two hours.

*Buildings.*—The buildings are generally spacious, and are arranged in the following manner: the door leads immediately into an oblong room, extending through, with a separation on each side of the passage, formed by a sort of balustrade provided with mats, where the servants sleep. This first leads into a second and similar room, where, instead of mats, there are sometimes bedsteads. From this second room, where the private apartments begin, two doors generally lead into a more or less spacious courtyard—"tsakán gídah"—surrounded by rooms in a very irregular manner. In this courtyard there are generally other bedsteads, covered on the top and on two sides with mats, and sometimes a shady place, enclosed on all sides with mats, is formed. The houses are built of mud, and a few are whitewashed; they are all flat roofed, the roof being formed by planks of the dúm-tree covered with mats, over which earth is thrown, and in the houses of the wealthier people, there is an upper story,—soró—consisting generally of one very large room, to which a staircase, "abénhawa," leads from the courtyard.

The houses are arranged most appropriate to the climate, and similar to that in which, as I was assured by my friends the Tuwátis, the houses of Timbuktú are built, and being enlivened by children, doves, and young ostriches, present a curious sight to the traveller.

Of *public buildings* at present there are but few, and out of seventy mosques, which are said to have adorned the town in former times, but ten are still in use; not more than three of these seem to deserve the name besides the great mosque; they are called Msíd Mfli, Msíd Ehení, and Msíd el Mekki. Even the great mosque, which is near to the fádah, has nothing particular about it, except a high tower, called *Mesallajeh*.\* For a place such as Agádéz, which, like Timbuktú, is situated in the midst of warlike hordes, a high tower is of the greatest importance, in order to be aware beforehand when a razzia or a caravan is approaching. Agádéz had therefore such a tower probably from the remotest period, but the present one is of recent date, having been begun six years ago, and it has just been finished; the ruins of the former are seen at a little distance to the south-west. I was very sorry that I was not allowed to ascend it, the Kádi, who seemed to have some antipathy against Christians, assuring my companion, Hamma, in my presence, that there was at present no entrance to the tower, the former one having been walled up on account of the Kélgeris, who continually desired to go up to the top.

\* Masallá signifies in Arabic a place of prayer.—R.



In its construction the tower is very simple, being built entirely of the same materials as the houses, viz. earth and wood. On the ground a number of thick quadrangular pillars, in several rows, support a more solid roof than is usually seen here, and form several halls. From them the tower, measuring at its base about thirty feet at each of its four sides, rises to a height of about ninety or ninety-five feet; the earthen walls diminish in thickness, so that each side does not measure more than about eight feet at the top, and are strengthened and supported by thirteen layers of planks of the *dúm-tree*, which, not closing together, project on every side about three or four feet, while in the interior they form a kind of ladder for ascending the tower. There are seven openings on each side, by which the interior receives light.

The town is surrounded at a little distance by slight undulations in the stony surface, of great extent, where in a sandy soil there is plenty of brushwood (all *talhah-trees*, *Acacia Arabica*), of herbage, and wells of very good water. This is a great advantage to the place, the caravans finding food enough for their camels near the town, while in most of such places it is necessary to send the camels off to a great distance. There is also plenty of firewood. These pleasant valleys, where you may forget that you are on a stony *hamádah*, have different names; that to the S.W., which is at a greater distance, and where the salt caravan of the *Kélgeris* was encamped, being called *Mermeru*; that to the S.E., *Tésak*; that to the N., quite near to the walls at the north-western corner, having the name of *Amelúlfí*; and finally, the one to the N.E., on the road to *Tín-Téllust*, is called *Ta-gurast*.\* These valleys near the wells are capable of cultivation, but at present there are only two small orchards in *Amelúlfí*, where vegetables are cultivated, all the other vegetables and fruits consumed by the inhabitants, such as melons, cucumbers, and principally *melúkhiyah* (*corchorus olitorius*), being brought from the valley called "*el Hakhsás*," about three hours distant to the N. of the town.

All the water which is used for drinking in *Agádéz* is brought from the wells which are situated in these depressions, the water inside the walls having a disagreeable taste, and, cool as it is, being considered unwholesome. There were formerly eight wells in the town, all sunk through rocky ground to a great depth, but at present only three are in use, the others being filled up; of those still in use, the principal one, a little W. of the market, is called *Shedwánkah*; the names of some others which have an historical interest have been mentioned before.

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\* See Map.

## APPENDIX.

## I.

*Vocabulary of the Emghedeste Language.*

sun	uenu	mountain	thánjí
moon	hándu	valley	ár'zer
heaven	bínf	road	henbíri
earth	kendía	house	hakau
water	ari	garden	aférrek
fire	hórd	horse	bár
wind	ahú	camel	jan
rain	kerneki	ox	hau
day	zaezerú	donkey	fárka
night	kíggi	sheep	hénkun
(morning)	el'fejr	goat	figgi
month	hendun	ostrich	ter'átter'
year	kírí	fowl	kerneki
to-day	zaezerú	good	akín
yesterday	baef	bad	adéskáb
(to-morrow)	e'suebha	dear	egeb
people	aberúa	cheap	{ enegéb
man	berfúa	much	{ er'adéráji
woman	waeí	little (few)	bébbau
child	azekaena	great	kétta
father	enbába	small	bír
mother	enána	warm	haketta
brother	bírí	cold	arekénbafir?
sister	kaena	new	kauríásnací?
Sultan	kókeu	old	eltháki
friend	ennóá	strong	hajenú
head	benr'ú	weak	kébbau
body	guéngo	heavy	emm'ekau
mouth	mai	light	katénó
nose	níní	far	hafestúsa
eyes	múa	near	amúr
heart	tekérsút	white	aménekti
hand	kánba	black	kajúra
foot	kae	fast	bífbó
milk	hauf	all	thánbi
cheese	káshí	more	kéffo
butter	kí	less	bébbu
meat	hámú		ájeb (identical with
salt	kírí		egeb)
dates	guerúe	how much	mérgi
rice	mau	where	mekíkel
ghussub	haení	here	enkírí
shirt	tekéjiu	on	bín
blue shirt	téblúa	under	kéndi
(robe)		when	{ mend-éffú
cap	fágel		{ lek-éffú
(trousers)	úéndú (Hausa)	now	waeí
sandals	ta'mú	before	éggar'
desert	keníggi	why	bíní??
village	kúra	yes	ák
town	kar	no	hór
tree	tamet	go	koi
source	mú	come	ajú
well	beníkkau	give	ettanáni??

put	sakker	I have	aberaidarú
lift up	dók	thou hast	aberađer'ú
take	jínni	he has	aberaídár'ú
beat	báket	we have	aberaíbódarú
bind	hauí	you have	aberaidarú
mount	kir	they have	aber'ajarájúdarú
dismount	zenbú(keti)	I	ar'ae, ar'aedh
buy	anímerr'a	thou	kí
sell	daye	he	ar'ú
drink	nín	she	taméndem?
eat	wan	we	ar'ída
speak	kimaná	you	hénnor'u
hear	mau	they	ar'ú
see	hasi	they (fem.)	ar'idú
be silent	danr'i	one	nifó, fem. kifó
he died	abún	two	ahínka
he knows	aibain	three	ahínza
we arrive	aitu(keti)	four	etthákí

The Emghedesie people do not count further than four; from five upwards they make use of the Arabic.

Give me something	nar'í haefo
Give me water, that I may wash my hands	nar'í ari ayahúmmi ankánba
Bring the camel-saddle, the sword, and the lance	kau zauketi élkif ú takóba u ígí
To-night you will have moonlight	aró kiggí amé hendéin gumá
The sun is very warm to-day	úénú zaezerú kárnú bébbá
Yesterday there was much rain	bí ári babó
You must bring firewood, it is cold	koi sókete tugújio yé
I am very ill to-day, I must take medicine	dári bebbá zaezeru aibara ánnasa só-fari
To-morrow we shall start early	E'subha ánd el féjr aireken
The people of Agádéz are ignorant people; they do not know what is right	baréú Eghede en baréú fútú, ennéba haeka kím
Thy father and mother are still living, or are they dead?	anána anbába anne hína ko abún
Where live (encamp) the <i>Avélmiden</i> ? have they a greater number of camels or of horses?	Kóra zenbú Súрку me yan abébbú mín bará abébbú
how do they call their market-place?	yóbu Súrgu auenni
Bégl	Bégl
This woman has milk to sell; will you buy it?	[Wae ro hua aberá eddaro aibara endaye dór?] Wae ro amé hua aibara andai-ána
All the women in Agádéz, if you except very few, are come from Sudán there is scarcely one that knows <i>Temáhirgh</i> (the Targiah)	Azóú engekai (? Eghede) akauteri énd e' Sudán mahó kifó nibi <i>Serhúnekt</i>

## A SHORT DIALOGUE.

How do you do?	sendínkínf
How is your family?	ma kénne hóg'e
How does it go on?	manaréüen
How is the state of health of the people of your house?	[ma n'shéffet aberúa men hóg'ú] ma n hóg'u koiu
(All) well?	[koiia] elrafia
What people are arrived from Sudán; what news have you got from Sudán?	abérúa méndem átían dá e' Sudán. ma n'isalen atehén nesí men e' Sudán

All quiet.	[kóthi] el rafia
The market has been, or has it not been ?	[Ma 'eníába abera ko eshíah] aibara koi yóbu ashiángá
(Were the prices) dear or cheap ?	ágéb ko ánegéb
When do we start for Sudán; to-mor- row or after to-morrow ?	mand-éffa airekoye e' Sadán e' subhahkó bibífo
To-morrow.	e' subhah
We do not go; no, we go in the night.	ári hór'í, ari-s-ekken; hór'i, kíggí aire- koye
What are the news ?	ma n' ísalén
The news I did know, which news you know; that are the news which you know. I told (all) what I have heard, but you know nothing.	ísalén ábera anibae ísalén nébí ísalén engénúdé zé ránnin, nibai arae hári zé mau, nin kí n'bai haeka
Come, I will tell you (something).	Éyú hér nesí ar'ae
I come.	ar'ae nekaye
Tell me.	herresí
Come, we will go to that place.	okiú ketí airekaye da' éffau
I go not (now), wait and we will go.	a-s-ekkoye sebburu aire-koye
Let us go and eat bazeen ?	Aire-n-koye ari-wau thasú

## II.

## Route from Agádéz to Sakatú.

1st day. The caravan starts from Agádéz in the afternoon, and the people encamp in the Wadí, called *Uleye*, where there is a well.

2nd. *Kérbúb*, a Wadí, where there is water in the sand. You arrive after sunset, having started at daybreak.

3rd. *Aa'zeru*—arrival at sunset; started before daylight. Between *Kérbúb* and *Aa'zeru* there are but very few stones, but all is covered with pebbles, and here and there a little sand.

4th. *Tebérhurt*—arrival after sunset, having passed a watering-place called *Aruthes*. All pebbles and stones.

5th. *Ingál*, a small town—arrival at sunset. Pebbles; very few stones. From *Ingál* the town of Agádéz is provided with cattle. A gate is called *kófa n Ingál*.

6th. *A well*, whose name my informant did not remember. Arrival at about four o'clock in the afternoon.

7th. *Afayen*, a Wadí, where you arrive at the Aser. Pebbles and sand.

8th. You encamp on the plain a little before sunset.

9th. The same; but here covered with some herbage. At sunset.

10th. A spot called *Semyetayew*—arrival at sunset.

11th. *Jobeli*, a considerable place; the market of the *Kélgéris*, belonging to *Adar*, whose territory begins here. You arrive at the Aser, after having passed on your road *Tésak*.

12th. *Avelimmiden*—an encampment at sunset.

13th. *Erzárúr*, a village—arrival about one o'clock. Road very stony.

14th. *Ténfáf*, a village—at sunset. Road stony.

15th. *Dukrausu*, a village—about one o'clock.

16th. *Muzki*, a village—at sunset. Always stones.

17th. *Kunni*, a village. Arrival a little after noon. All rocky.

18th. *Jánt*, a village—at sunset.

19th. *Warnu*, a considerable place—at one o'clock.

20th. *Sakatú*, where you arrive a little after sunset.

## III.

Route from Agádéz to Marádeh, according to the *Kélgéris*, *Gojéri*.

1st day. *Er'zer*, a Wadí, where you arrive at the Aser, after having started from Agádéz in the morning.

2nd. *Emrénded*, a Wadí—arrival at the Aser.

3rd. *Urzedem*, a Wadi—at sunset, after having travelled over sand.

4th. A valley, which, according to Gojéri, is called *Temie*, but which, according to his companion R'áser, bears the name of *Afén kák*. You arrive at the Aser. There is water in the valley.

5th. A valley called *Teuutú* according to Gojéri, according to R'áser *Begem*, where you arrive at sunset.

6th. *Akúkú*, where you arrive at the Aser, after having passed a Wadi, called *Zeriten*, where you fill your water-skins. The whole road consists of pebbles.

7th. *Ter'áraderez*, a Wadi—arrival at the Aser.

8th. *Etáddul*, high sand-hills, where you arrive about noon.

9th. *Ienkeb*, a Wadi—about two o'clock in the afternoon.

10th. *Yaménma*, a valley with water, where you arrive at Aser.

11th. *Zermenétta*, a village—arrival about the Aser.

12th. *Avelimmid*, a considerable place, where you arrive about one o'clock in the afternoon.

#### GÓBER.

Here begins a country of considerable extent, and inhabited by a warlike set of people, with whom the Sultan of Sakatú is always waging war, generally without success, and without being able to convert them to Islam. After their capital (Góber) had been destroyed by the Fellanis (the so-called *Fellátahs*), they built a new town\* not far from *Marádeh*, with whose inhabitants they are intimately connected, by their common interest, as opposed to the Mohammedans; and I was assured that the people of Góber had become more powerful than ever, and that there was very little probability of the Fellanis ever being able to subject the country of Góber to their sway or to their creed.

The other villages and small towns of Góber are as follows:—*Akrúfa*, *Layem*, *Gindesem*, *Kelenzel*, *Méddoo*, *Télel*, *Dért*, *Migeshee*, *Derúdu*, *Artwa*, *Küllum*, a considerable place, where the first Thobeli (chief) of the *Touárik*, of the tribe of the *Avelimmiden*, has his residence; then the villages *Ténku*, *Terzarúf*, where is the residence of the Thobeli of the name of *Untíkin*, *Anekúnt*, *Kadémbu*, *Tennebu*, then a more considerable place called *Shélibi*, which has its Sultan by name *Abúlu*, then the large place *Tobeli*, which likewise has its own Sultan, named *Masári*. [Tobeli, in the itinerary of the route from *Agádéz* to *Sakatú*, is mentioned as a place belonging to *Adár*.] Next follows another village called *Férríji*, which has its own Sultan, *el Hássem Ajillema*; then a place called *Fadíe*, a village called *Mararúf*, and a place called *Ladém mauor Ela-démmanu*, where the brother of *Abd-el-Kadir*, the Sultan of *Agádéz*, whose name is *Ittegáma*, is living; then a village called *Tenfáfi*, and another called *Ilafédúta*, and a place called *Núba*, and another called *Gíru*, and another called *Ternú*, and a village called *Kermellam*, and another called *Mezággi*, and a village called *Zérára*. These are the villages and towns belonging to Góber.

13th day of your journey from *Agádéz* to *Marádeh*. Having started from *Avelimmiden* as general at sunrise, you arrive about the Aser in *Ladémmú*, the above mentioned village.

14th. *Gúdnézná*, a village, where you arrive about one o'clock.

15th. *Aherúf*, a village, where you arrive at the Aser.

16th. And the next three days you travel over the *Hammáda*, until on the

19th. You arrive at the end of your journey, the large town called *Amrádeh*, generally called *Marádeh*, which is under the authority of the Sultan of *Kashnah*, at least nominally. In going from *Marádeh* to *Tásawa*, a journey of two days, you pass the village called *Téberi*.

#### IV.

##### *Route from Agádéz to Bilmah, according to the Emghedeste, Eberi.*

1st day. You start in general in the evening and sleep the first night at about half an hour's distance from the town, in the valley called *Efiggt Entár'elénmet*.

\* The former capital of Góber, as I learned afterwards, was called *Gauángazó*, which was destroyed by the Sultan of *Marádeh*, not by the Fellanis. The name of the new town is *Téberi*.

2nd. *Tintábórah*, a valley with water, where you arrive at the Aser, after having passed early in the morning the valley called Amelúfi.

3rd. *Bínébbá*, a valley with dúm-trees, where you arrive a little before sunset. In the morning you keep for a while along the valley of Tintábórah, after which your way lies over the rocks, passing through three different valleys before you arrive at the valley called Bínébbá, viz., Eméllier, Arátáh, and the Wadí called *Amdégera*.

4th. *Tyndaunen*, a valley with water, where you arrive about one p.m.

5th. *Atezérket*, after the Aser. All rocky ground.

6th. About Aser you encamp on the Hammáda, consisting of pebbles.

7th. About the same time you encamp on a spot among the rocks, called *Tazel*.

8th. About sunset dismount on a spot between the rocks, called *Efígagén*.

9th. About two hours after sunset encamp between the rocks on a spot called *Debradu Ezákher*, from whence you start after a short rest.

10th. And the four following days you travel night and day over the Hammáda, where there are neither trees nor stones and scarcely any hashish, after which you arrive in the night of the

15th. At the village called *Fáshi*, where there are plenty of dates and two castles, one of which is in ruins, while the other is in good repair.

16th. About two hours after sunset you encamp on the Hammáda, when, after two or three hours' repose, you start again and continue the whole of

17th. When, after having dismounted and started again at the same time as the day before, you arrive in the evening at *Bilmah*, where, as well as in *Kuwar*, which is near to it, there are plenty of palm trees and of salt. The inhabitants of these places, as well as those of *Fáshi*, are the *Béraunis*, as the *Tibbuss* are called by the people of *Air*.

## V.

### *Route from Agádéz to Tuwát, according to the learned Tuwáti, Abd-Allah.*

1st day. You start in the afternoon and encamp the first night near the village called *Elkhasás*, in the fertile valley of the same name, distant from Agádéz about three hours or a little more.

2nd. *Telowa*, a valley, where you arrive about the Aser, after having passed on your road several valleys, separated, as is always the case in *Air*, by more or less elevated rocky ground. Early in the morning you cross the Wadí called *Azal*, then that called *Tufátekín*; after which you pass about noon the celebrated valley, by name *Aerinállem*, after which, before you arrive at *Telowa*, there is still another Wadí to cross, which is called *Isérserén*.

3rd. *Uklef*, a valley, where there is water as well as in *Telowa*. This day you cross but one Wadí, called *Asa*, after which your road passes over a stony ground called *Tinín*, covered with pebbles. Arrive in the valley of *Uklef* at the time of the Aser.

4th. *Makám el Sheikh ben 'Abd el Keríme*, a sort of mosque, generally known under the name of *Msid Sídí Bagdádi*. You arrive at this place about an hour before sunset, after having rested during the greatest heat near *Auderas*. In the morning your road passes for some time along the Wadí *Uklef*.

5th. *Tiggedah*, a valley with a deep well, where you arrive at the time of the Aser, after having passed in the morning the valley called *Er'arar'ra*—[the more accurate name of this Wadí is *Er'ar'ar n' Déndemu*]—and after having crossed a small mountain ridge, keeping along the Wadí *Asadah*, from which the Wadí *Tiggedah* is separated by rocky ground of small elevation.

6th. Encamp about sunset on rocky ground. Pass in the morning the valley called *Tefárroet*, then cross for some hours gravelly ground, with few large white projecting stones, after which you descend into the valley called *Agaten*, where, near to a well, you pass the hours of the greatest heat.

7th. *Tensif*—arrive before the Aser.

8th. *Iferwán*, one of the finest valleys of *Air*, with a village of the same name, and plenty of date-trees bearing excellent fruit. Arrive at sunset, after having passed a number of small valleys called *Ar'itám*.

9th. *Tidik*, a valley, with a village of the same name, where you arrive before the Aser, after having passed the well called Neggaru.

10th. *Sif mellel*, a locality in the gravelly ground, over which your route lies to-day. Encamp at the time of the Aser.

11th. *Zelit*, an inhabited spot, where you arrive about one p.m., after having passed a Wadí called Ageléndi, Fadé, and Merátha.

12th. *Iji Nemakheder*, called by others Efinebákka, where you arrive at sunset, after having marched the whole day over a pebbly plain, called (by the Arabs) Shaebet el Ahir.

13th. You encamp on the Hammáda after having crossed a rocky ground full of pebbles, and having passed a Wadí called Tiúten. On the spot where you encamp you find a little hashish.

14th. You encamp, at one p.m., on a spot where there is the herbage called el hádu, after having crossed a stony ground called by the people Timásgarén.

15th. *Neswa*, a well not far to the W. of Asiú, where you arrive after the Aser, after having passed a valley called Tafaástau.

16th. *Teráf*, a locality on the Hammáda, where you encamp at the Aser.

17th. *Tinterábe*, a Wadí with a famous cavern called An'gidet en Nib, where you arrive at the Aser, proceeding always on the Hammáda.

18th. Encamp at sunset between sandhills called *el 'Ark*.

19th. *Tageréra*, a Wadí, where you arrive about one p.m., after having entered a mountainous tract called Aghil.

20th. *El Ar'sil*, a valley with water, where you arrive a little after noon, after having crossed a rough ground called Esfá mellea.

21st. *Tékderen*, a Wadí, where you arrive after the Aser.

22nd. *Er'ararén*, a Wadí, where you arrive at the time of the Aser, after having crossed a stony ground full of pebbles.

23rd. *Zerzer*, a Wadí with water—arrival at the Aser, after having passed a ground full of pebbles.

24th. *Ifaek*, a Wadí—arrival at Aser—ground the same.

25th. *Wadí el Imkám*, where you arrive about one o'clock p.m. Pebbles.

26th. *Agnar*, a plain enclosed by ridges—arrive at the Aser, after having kept first along the Wadí el Imkám, which leads into another Wadí called Temár'aset, from which you enter the plain.

27th. *Turarén*, a Wadí where you encamp about the Aser, after having crossed another Wadí called Utúl, into which you descend from the gravelly soil.

28th. *Tylak*, a Wadí, where you arrive after the Aser, having crossed another Wadí called Eherí.

29th. *Temássanégettí*—arrive at the Aser, having passed through another Wadí, Tenár'rakeli.

30th. *Ennémmegel*, a Wadí, where you encamp at sunset, the valley being rich in trees. To-day you have to pass two other valleys called Wadí Eresnurén and Tintaheli,—all these valleys being separated by an Hammáda of an even surface without stones.

31st. *Tehárráket*, a Wadí commanded by a mountain called Turaeret, where you arrive about the Aser. Pebbles and stones. In Tehárráket you change your direction, the road turning here more to the N. on account of the mountainous tract to your right.

32nd. *Hággara*, a Wadí with a well called Tehélehóhet, where you arrive after the Aser.

33rd. *Sif mellel*, another locality of the same name as that above mentioned, where you arrive about the Aser, after having passed two Wadís, of which the first is called Akdhan and the other Emmujáj.

34th. *Sheikh Salah*, with the surname Melá el akhsen, near to whose chapel, situated in the mountainous tract called Tésennu, there is water. You arrive a little before sunset. Hammáda.

35th. *Ter'azzert*, a little before sunset. Hammáda.

36th. *Enmestr*, a Wadí, where you encamp after the Aser. In the morning you keep along a Wadí called Meniet, where there is a well, after which you pass another Wadí called Afisfes, while the last part of your road leads over the Hammáda, consisting of gravel.

37th. *Etgúgulet*, where you arrive at the time of the Aser. In the morning for

a while you keep along the Wadî Emmesîr till you reach that called Arâk, and, following it up, you pass two water-places, Sékiyah, and farther on one called El Hajar.

- 38th. *Tajemût*, a Wadî, where you encamp before the Aser.
- 39th. *Koikoidât*, a group of small valleys, where you encamp at one p.m.
- 40th. *Gûrdî*, a Wadî, where you arrive a little before sunset, after having passed another Wadî called Terâtûmin, where there is water.
- 41st. The well in the long Wadî *Agmemâr*, which is reached about Aser.
- 42nd. Encamp about the same time in the same valley of *Agmemâr*.
- 43rd. *Ensemûh*, where you arrive after the Aser. In the morning you still keep along the large valley of *Agmemâr*, until you ascend a mountain; from which you descend into another valley called *Elbôtta*, where there is a well called *Tin e' Sîmân*, proceeding along which valley you reach the place of your encampment.
- 44th. *El R'âbah*—you arrive at Aser after having passed on your road a depression called *El Sha'âb*, from which you have to ascend the higher ground to a forest of great extent and full of brushwood.
- 45th. *Insdlah*—about Aser; first keeping in the forest, then ascending a little. On or near the road from *Asiû* or *Nesua* to *Tuwât* are found the following tribes:—
- First, the *Imrâth* or *Merâth*, a very interesting and widely dispersed tribe. Next come the *Sakomâren*, a tribe very friendly to the *Tuwâtis*, living to the N. of the road. Then the *Tuwâh reg Teitâk*, the *Kelâbenat*, the *Ijran*, a separate section of the *Imrâth*, who drink from the water in *Wadî Tajemût*. To the N. of these, living near and within the boundaries of *Tuwât*, are the *Kalemellel*, or, as they are likewise called, the *Auelad Fâkki*, and, closely connected with them, the *Tegensâkkel*. Besides these two tribes of the *Tuwârik* there is in *Tuwât* another tribe called *Tiggehingslî*.\*

## VI.

*Route from Agâdéz to Mabruk, according to the Kelferwân, Bainah, and continued as far as Timbuktû, according to the account of Abd-Allah.*

This road is not at present a caravan road, but merely a path taken every year by the *Razzias* of the *Kelferwân*, in order to plunder the caravans on their road from *Tuwât* to *Timbuktû*, and it serves also for the encampments of the *Avelimiden*. *Bainah* went this road 20 times.

- 1st day. *Enudged*, a Wadî, where you arrive at the Aser, after having started from *Agâdéz* in the morning.
- 2nd. *Imintédent*, where you arrive at the same time (Aser), crossing many depressions in the rocky ground.
- 3rd. *Sakéret*, a Wadî, where you arrive at sunset.
- 4th. *Elmet Tudérret*, a Wadî, where you arrive two hours after sunset.
- 5th. *Agrédem*, about Aser. The whole day's journey lies over a *Hammâda* of red soil.
- 6th. *Elsâ Nelimân*, at Aser. *Hammâda*.
- 7th. *Timmia*, at Aser. *Hammâda*.
- 8th. *Ebelâr'lar'en*, about the same time. *Hammâda*.
- 9th. *Isakerén*, about the same time. The *Hammâda* is here covered with a little hashish. Here you change your direction, the road turning more northward.
- 10th. *Elsa Enhebbt*, about the Aser.
- 11th. *Igediân*, about 1 P.M.
- 12th. *Âkâr*, about Aser.
- 13th. *Keliyât*, a little after noon.
- 14th. *Ahalu*, a considerable valley with water, which you reach at 1 o'clock.
- 15th. *Akerû*, an inhabited valley, where you arrive about the Aser, having walked the whole day till after noon in *Wadî Akald*.

\* This itinerary, of which I have a continuation, containing the whole route from *Insdlah* as far as *Usthen Tuwât*, is far more accurate than the one which I sent some time ago to London, written according to information I obtained from another *Tuwâtî*, of the name of *Abd-el-Kadir*.



- 16th. *Kidál*, after the Aser.  
 17th. *Timákhali*, about Aser.  
 18th. *Asalár*, at sunset, after having crossed several depressions in the rocky ground. Here you find inhabitants, partly Arabs of the tribe of the Kintab, partly Touárik of the widely dispersed tribe of the Ifogas.  
 19th. *Ar'sher*, a fine valley, with date trees, corn, and tobacco; and the inhabitants have another valley, called Tesillite, likewise rich in dates.  
 20th. *Tir'aur'auén*, about the Aser.  
 21st. *Hallet el Sheikh Sidi el Mukhtár*, at which place of worship you arrive about 1 P.M.  
 22nd. Encamp at the Aser, on pebbly ground, all the pebbles being of white colour, between which a little hashish is growing.  
 23d. *Mabrúk*, at sunset. The Sheikh of this small town is called Míli.

#### From Mabrúk to Timbuktu.

- 1st day. Encamp on pebbly ground at sunset. On your right hand, towards the sea, you pass during the whole day sandhills, called Dhahar el hamár, or the back of the donkey.  
 2nd. 'Arg after the Aser, having still the sandhills on your right hand.  
 3rd. *Mámús*, a place with a castle recently built, to the S. of which is the well.  
 4th. *Tebúgai*, two hours after sunset, after having made your day's journey through sand, between which hashish grows.  
 5th. *Bu-Jebaahah*, a village with a very high tower, where you arrive at sunset.  
 6th. *Essebaeseb*, a little after sunset.  
 7th. Encamp among pebbles and sand about Aser.  
 8th. *Auelád Hauale*, a Wadí, where you arrive at sunset.  
 9th. *Tédémákket*, Wadí, after sunset.  
 10th. *Aberáz*, a spot with plenty of hashish, where you arrive at the Aser. From hence you have a view of the town of Timbuktu, where you arrive  
 11th. Early in the morning. *Timbuktu* is a large place, the first inhabitants of which were the Welah, of the name e'Rumáh. In course of time the Fulán entered the town, the Rumáh remaining under their authority. The place is at present quiet, and there are no disturbances made by the Touárik. The chief of the Fulán is called Mohámméd Lébbu. The standard of the market of Timbuktu is gold, cowries, and salt. The Touárik of the neighbourhood belong to the tribe of Tédémákket, but there is another tribe in the town of the name of Sigo. There are many merchants from Sahelch, Fás, and Ghadámis.

#### VII.

#### Route from Tin-Tellust to Agadéz.\*

Tin-Tellust, the residence of the Sheikh El Núr, and one of the most important places in the country of Aír or Asben, is situated at the bend of a large valley, which, gathering all the smaller water-courses from the right and left, is here forced by a large mountain-chain, stretching almost E. and W., to change its direction from the S.E. and N.W. to the W. This valley, although one of the most considerable in the country, is not rich in herbage, and cannot alone support the inhabitants scattered about in many small villages, or maintain the influence of the Sheikh. The portion called Tin-Tégganah, where we encamped, forms the pasture grounds for the Sheikh's camels and flocks. Though some of the trees, particularly the Talhab, rise in this part of the country to a size unknown in other parts of the Desert, still no idea can be formed of that profusion of vegetation which enlivens the valleys along the southern part of the road to Agadéz.

Generally speaking the whole of Asben consists of a labyrinth of valleys, separated from each other by more or less elevated rocky ground, overtowered by imposing groups of mountains, rising to a height of from 2000 to 3000 feet, or even more—the whole, with its bushes and clusters of trees, forming the "*dawah*" or wilderness, in contradistinction to the "*dayt*" or naked desert. The first part of the

\* See Map.—Ed.

road from Tin-Tellust to Agádéz, the general direction of which is S.S.W., while that of the valleys is from S.S.E. to N.N.W., passes principally over rocky ground. To the S. of Tin-Tellust, at the distance of about 13 geographical miles, and stretching almost W. and E. along the northern side of the road, rises another considerable mountain called *Bondayah*, which separates the road to Agádéz from that to Damergh and Zinder, and gives to the latter at its commencement a strong deviation to the E. (its general direction seeming to be nearly S.); and to the southward of the Bondayah, separated from it by a very uneven, rocky ground, are the two largest mountain ranges of the whole country, viz., the *Eghellál* (Ekelál), running N.N.W. and S.S.E., and the *Baghzen* (Baktsen), the direction of which seems to be from N.E. to S.W. The road, passing far from the Baghzen, almost touches the western foot of the northern part of the Eghellál, while on its western side it is bounded by elevations of less dimension, but of more varied shape, particularly the *Tshereka* (Cheréka), a magnificent bifurcated mount, the two summits of which, separated from each other almost to the foot, rise like sugarloaves close together to nearly the same height.

After having followed the broad but almost naked valley of Tin-Tellust for about a mile and a half, and having crossed an important portion of it, coming from S.E., the road ascends the elevated rocky ground, where it proceeds in a zigzag direction, giving the traveller a view of the mountains round him at every moment in different groups and from different sides. The valley of *Eghelloua* (Ekeloua), running from about S.S.E. to N.N.W., is the first which is crossed. On our journey to Agádéz there were plenty of wells full of water at 1½ feet depth, while only a month later on our return we found them all dry. This also was the case in most of the valleys, the people being apparently too idle to dig to any depth. The valley of Eghelloua does not seem rich in vegetation, being little more than a broad channel for the waters in the rainy season, and it is greatly surpassed by the *Tegarrérea*, which, receiving a great many streams, particularly from the *Bondayah*, presents a charming view of fresh herbage and fine trees. At supports a small village of the same name, situated at the juncture of a considerable branch with the principal valley, the direction of which is here almost E. and W. At some distance from the village we were obliged to stop, in order to hire two more camels for myself and servant, there being no camels to be had at Tin-Tellust, on account of the installation of the new Sultan and the projected *Razza* (Ghassiyah). My own fine Mehari had been carried away by the *Bfedeyeh*. On our return we passed a little more to the W., thus avoiding the easterly deviation of the valley.

After having left this fine valley the road again ascends the rocky ground, first to the W. on account of the lower ridges of the *Bondayah*; farther on, towards the S., making straight up to the western descent of the *Eghellál* (Ekelál), at the northern base of which, at about 28 miles distance from Tin-Tellust, there is a very rich valley, which, from a neighbouring village of that name, lying a little to the E., is called *Tshizólen* (Chitsólen). This valley being inclosed to the E. on both sides by spurs of the higher mountains, opens to the W. into a considerable low plain, thickly covered with trees and hashish,\* while to the S. the steep sides of the *Eghellál* rise and bound the landscape, the lower ridges to the W. being overtopped by the curiously shaped summit of the *Tshereka*, whose two peaks are seen from this in one line. In this fine valley we breakfasted on our going to Agádéz, and passed the last night on our return. I was anxious to visit the formerly so important place of *Asedí* (known in Europe as *Asúfí*), by which it was understood our road should pass; but I could not induce my companion *Hamma*, under whose personal protection I was travelling, to deviate that short distance to the W. without the payment of an extra sum, which, from our limited means, was quite impossible.

The *Wadí Tshizólen* seems to be the last of the larger valleys, which, in coming from the N., run E. and W.; from hence almost all the valleys extend from S. to N., which is equally the case with the larger mountain chains, viz., the *Eghellál*, the *Baghzen*, the mountain range from which rises the majestic cone of the *Dogem*, the *Abeela* (*Abilah*), and almost all the other ranges, so that henceforward the road to Agádéz traverses either fine valleys, some of them of great length, or defiles and mountain passes.

\* Hashish, or rather Hashiahah, signifies Herb in Arabic, and is applied to various plants.—R.

For the first 3½ miles after having left the valley of Tshiañleh our road passed at a little distance from the western declivity of the northern part of the mountain of Eghellál, which here rises abruptly to the height of about 2000 feet, while to the right lower ridges of rocks stretch along in a parallel direction, sometimes overlooked by the higher tops of the more distant mountains. From this rocky ground we descended into a fine valley by the bed of a rivulet, lying almost N. and S., leaving which by an almost imperceptible descent to the right we entered the large and irregularly inclosed valley of Eghellál, of which the former seems to be a branch.

Shortly after entering this valley the country becomes more open, and while you distinguish the smaller rocky mountains to the right of the Tsheréka down to the Agatha and Beláséga, to the S.E. you suddenly obtain a view of the long chain of the Baghzen, appearing behind the majestic Eghellál. With the Baghzen I was disappointed; for, instead of the towering peak which I had expected, this famous mountain from the distance wore the appearance of a long and not very lofty chain, stretching from N. to S.S.W. in an almost uninterrupted line. It continued to present the same outline during the whole of the next day's journey. The second night of our journey to Agádéz we slept without a tent at some distance from the well of Eghellál, in the flat bottom of the valley; after having travelled 23 miles, while on our return we stopped but a few minutes at the well to water. The country at the foot of the Baghzen, by the road of Afkiss, is said to be rich in herbage, forming the pasture grounds of the Kél-baghzen and the Kél-en-neggaru, while some more favoured spots, like the valley of Tshámmia, produce date-trees.

The next day's journey from the well of Eghellál (at the distance of about 2 miles from which to the S.E. there is a village of the same name) differed much from all I had before seen in the country of Asben. Instead of narrow valleys or open deserts, a pleasant open country stretched out before us to the S.E. as far as the long range of the Baghzen, uninterrupted only by low ridges of rocks or a few isolated cones. The road itself passed first along the valley of Eghellál, when, after this valley turned to the W., and to the S. of the mountain of Agatha, with the village of the same name, it crossed a plain, which is by low narrow ridges divided into several smaller basins, with a few dry water-courses running from E. to W. The view became rather more confined upon our crossing, at 7 miles distance from the well, the winding bed of a large winter stream, inclosed between two ridges running from S.W. to N.E. While the country to the left remained open, to the right a less regularly formed mountain chain approached from the N.N.W., where it almost joins the singularly-shaped mountain of *Beláséga*, with its three summits. The two outer ones are broad and almost flat, while that in the centre tapers into a point.

At 11½ miles from the well, after passing through a small mountain defile, the country assumed another aspect. It seems to be suddenly cut in two by a wide chasm stretching from E.S.E. to W.N.W.; and while to the E. it is divided by a low cliff of rocks into two branches, towards the W. it opens into a wide regular level, bounded to the N. by the irregular mountains just passed. To the S. the northern side of the majestic *Abeela* forms the steep barrier of the plain, which stretches out towards the W. as far as the eye can reach, uninterrupted only by a few low ridges and one isolated cone. The *Abeela* sends forth at its eastern side several nearly isolated cones of peculiar shape, giving a peculiar character to this district, as all the cones from the Tsheréka southward as far as the southern end of the *Abeela*, all lie in the same line. The direction of this wide valley between the *Abeela* and the mountain to the N. is E. and W., while, after passing the second large watercourse, the way passes almost entirely along fine valleys, running from S. to N. with the exception of the Wadi *Aaderas*. The first of these valleys is the beautiful Wadi *Tiggedah*, inclosed to the W. by the abrupt side of the *Abeela*, from which towards the S. several lofty cones project, while on the E. it is bounded by a lower semicircular chain, and joins the Wadi *Abeela*.

*Tiggedah* formed a transition from the poorer to the richer valleys of this country, for though there are no *düm* trees (*goreba*), still other trees and bushes, viz., the *talha*, the *addna*, the *gaw*, and the *krunka*, abound, and here alone, at the sides of the water-channels, I saw grass as fresh and green as in Europe, and quite charming to the eyes. In this beautiful spot we encamped on our journey to Agádéz after the third day's journey. But this valley, which at that time, with

the exception of the cooing of wild doves and the cry of a solitary antelope, seemed to be uninhabited and almost lifeless, was, upon our return, full of flocks and herds. We met here also a large salt-caravan, and a string of young camels bound to Agadéz. The Kél-ou-ueggaru, to whom this valley belongs, lead a nomadic life, going about from one valley to another, and never settling in one spot for a long while. They have here a small mosque built of stones, and covered with the trunks of the palm-tree.

A short interval of rocky ground, rising to little more than 100 feet, separates the valley of Tiggedah from the still more luxuriant one of *Asadah*, which, after having run from S.S.W. to N.N.E., here changes its direction, turning at the southern side of the Abeela to the W. After we had travelled about 2½ miles in this fine Wadi, we met a considerable slave caravan, and I also saw the first palm-tree since I had left Selúflet. The vegetation of this valley was so luxuriant, and the path was so shut up by branches, that my servant was once carried off his camel. The valley a little farther on winds between the approaching ridges, which to the E. form a glen, in which there is a village not visible from the valley. As we ascended one branch of the valley, over the lower ridges to the left, covered with greensward up to the top, I obtained the first view of the broad summit of the *Dogem*, which, rising majestically above the mountain chain, appears to be the highest in *Air*. I am sure that I am not wrong in estimating the height of this mountain at from 4000 to 5000 feet, while I think that the *Eghellal* and the *Baghzen* scarcely reach from 3000 to 3500, feet.

A short descent brought us through the rugged defile into the plain of *Erver* & *Déndemu*, covered with brushwood and small talhah trees, to the great annoyance of the traveller. This district is thickly inhabited by lions ("záki, or, abu n dawa," the animal of the wilderness); we ourselves met with several, and saw the footsteps of many more, while a species of ape (*beri*) about the size of a small boy is seen in crowds on the lower ridges, from which they descend into the valleys. Of these we saw several with their young on their back. In this forest of talhah trees we travelled along for 3½ miles, when we quitted the plain, which stretched much further to the S.S.W. on its E. side, by a glen leading towards the majestic mountains in front, but soon turning again to the S. we passed along several narrow flats, where, on our way to Agadéz, on the 7th of October, we were drenched in the last thunder-storm of the rainy season. We then entered a rocky plain, which on its northern side bends towards the E., where, over the lower extremity of the mountain of *Auderas*, a higher summit towers, while, on its southern half, the plain becomes more regularly inclosed on both sides by considerable groups of mountains. These ranges are entirely separated from each other, and bear the general name of *mountains of Auderas*. The plain of *Tur'ist* is famous among the Arabs as well as the *Kelows*, on account of the remains of a mosque, denoted only by lines of stones on the ground, of a great Saint called *Sidi Baghdádi*, the general resting place of the caravans. The *basaltic formation* has here supplanted the *granitic*. The whole plain is covered with loose stones, about the size of a child's head, of black basaltic rock, and I think it probable that a part of the mountains around consists of the same. The basaltic formation is most evident in a deep fissure in the plain, the surface of which, level in the northern half, becomes more rugged to the S. of the fissure, while it is covered with herbage almost all over. Here you are on about the same level as that of the *Hammádah*, on which Agadéz is situated, and a distant prospect opens before you, the country seeming to be one rugged desert, out of which a few isolated cones rise. This circumstance makes me believe that the people are right when they say that *Auderas* is visible from the summit of the *Messillajeh*.

By a northern branch of the *Wadi Auderas* you descend from this rough ground and enter the narrow but rich valley which, thickly overgrown with palm trees along the sides of the broad watercourse, winds through this mountainous district. It takes its origin from the *Baghzen* itself, where the living sources of water are said to be. At the foot of one of the two villages in this valley, *Aerwen-wa-n-Tidrak*, we encamped on the fourth night of our journey to Agadéz, after a march of about 23 miles. The other village, called *Ifargén*, is situated higher up the valley on the road from *Auderas* to *Damergú*. On our return we stopped but a few minutes at the well in order to fill our waterskins, when I had just time enough to make a sketch of this picturesque spot. On our return likewise, on descending

from the rocky ground into the valley, I saw a barbarous method of tillage,—three slaves being yoked to a sort of plough and driven like oxen by their master. This is probably the *southernmost* place in Central Africa where the plough is used. I was assured that neither in Haussa nor in Súdán do the people make use of it, the hoe (*fértaína*) being the only instrument used for preparing the ground. The valley of Auderas, as well as the succeeding valleys on the road to Agádéz, are capable of producing not only ghussub, but corn, wine, and dates, as well as almost every species of vegetables; and there are said still to exist about 50 gardens (*góna*, pl. *gónakee*) near the village of Ifarg'én, higher up the valley. At present these fine valleys are left almost entirely uncultivated, and instead of seeing useful produce the traveller has no little difficulty in making his way through a luxuriant but wild and useless vegetation. These valleys are inhabited by the *Imrád* (generally but less accurately written *Imráth*).

On leaving Auderas we took a more easterly road than the common one, which, after having crossed very rugged ground for about 12 or 15 miles, keeps along the fine deep Wadi Téliwa for about 10 miles, and then ascending for about an hour, reaches Agádéz in three hours more. Our route, after having crossed 12 miles of rocky but rather level ground, and having passed a spot where a little *tróna*, or natron, is obtained, brought us to the long *Wadi Búddéh*, which we followed up for about 13 miles, when we encamped in an open plain, where the valley turns to the E., near a cemetery belonging to the inhabitants of a small village called Tawar Nuájúú. On this evening, the 8th of October, at about half-past eight o'clock we heard a great noise to the N.E., which I supposed to be an avalanche, until, after my return from Agádéz, I learnt from my colleagues that they had seen a splendid meteor about the same time. In this valley a prickly plant, called "karéngia," is a real torment for the traveller; and, besides other trees and bushes known to me before, I saw great numbers of a plant resembling ivy, and called "griffence," the fruit of which, being just ripe, was about 1½ inch in length, and less than 1 inch in thickness. It is of a red colour, has a sweet but rather insipid taste, and is much relished by the people of the country. On our return journey, near this spot, we pursued a party of five lions, which we had observed to the right, till they made their escape behind the ridges which stretch along the eastern side of the valley in its upper course. The lion of Asben is not equal in courage to that of Barbary.

Your course from Wadi Búddéh to the *Wadi Tefarrakád* passes a chain of hills bounding the upper part of the valley Búddéh on the S., and inclining to the E., after which you pass for a few miles over rocky ground of no great elevation. Wadi Tefarrakád is perhaps still richer than the former, the water-channel here being divided into several branches, so that the water spreads the luxuriant vegetation to a greater breadth; but the road does not keep along this valley the same distance, the watercourse turning more to the E., and after 3 miles making a very considerable bend in this direction, while the road crosses some rocky ground for 3 miles further. Here we met a small caravan of four persons representing four different modes of travelling in this country, one being mounted on a camel, another on a buffalo, the third rode a donkey, and the fourth made use of his own legs. Having crossed the Wadi, which here turns to the E., once more, we took a westerly direction, over uneven, rocky ground, from which rise two isolated cones, one of them visible to a great distance—for 4½ miles, when we descended into another valley, of the same richness of vegetation, but of greater breadth and length. This is the *Wadi Bó-el* (Boghel), where I was agreeably surprised in finding at least a small ghussub field, which had been cultivated last year, showing what these valleys might be, and probably once have been. There was no well near it, though water may be found everywhere in these valleys, but not at the same depth. The ground was covered in many spots by a sort of wild melon, "jan gúnnah," and in the thick foliage of the trees the guinea-hen, or "zabó," was cackling. At the end of this valley, where it opens into a handsome basin, the watercourse keeping henceforward more to the W., while the road turns to the E., on our return journey, I first saw the tree called "bauré." Though I was told that in Haussa, where it is common, it reaches a much greater size, I still felt great satisfaction, after my journey through the desert, in looking at a tree whose trunk, at the height of eight feet from the ground, measured not less than twenty-six feet in circumference, ending with a thick, beautifully shaped

crown, at a height of about eighty feet. At this place a travelling companion and friend of mine left, on his return to Afasás, where I should have liked very much to accompany him; but all my efforts to persuade Hamma to take this road, as he had promised to do, were in vain, too much time having already been spent in Agádéz, while he was obliged to arrive in Tin-Tellast before the setting out of the salt-caravan on its way to Bilmah. There are from 65 to 70 miles from this spot to Afasás.

On our return we encamped in this fine valley, where the road leaves it; but on our journey to Agádéz we passed the last night near its entrance, where it widens into a sort of irregularly enclosed rich basin, called Tansín Túngaiden. Here, on the W. side of the valley, the last hills rise, which overlook the surface of the *Hammáda*. We ascended these early in the morning of the 10th of October, when I was agreeably surprised to find this pebbly plain, which, according to the accounts I had received, I fancied to be a terrible waste, traversed by many large valleys, full of trees and herbage. Having passed almost the whole day in one of these valleys, partly on account of the Kélgerís and Itesáh, who were just removing their large camp from near the town, where they had conducted the new Sultan, partly because it is the custom in this country never to enter a place by daylight, we made our entrance into Agádéz about an hour after sunset.

	Tin-Tellast.	Miles.	
	Wadi Ekellowah.		
1st day.	----- Chissólen . .	23 . .	October 4
2nd "	----- Epehá . .	23 . .	" 5
3rd "	----- Tiggedah . .	23 . .	" 6
4th "	Aerwán-wa-n-Tídrak	23 . .	" 7
5th "	Wadi Búddeh . .	25 . .	" 8
6th "	----- Búghel . .	23 . .	" 9
7th "	Agádéz . . . .	3 . .	" 10

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## VIII.

*Account of the Tuwarth or Túaryg Tribes.*

In this account of the Túaryg I shall not go back to remote times, or make inquiries concerning the origin or the history of this people, but shall restrict myself to a description of the various large families of the Túarygs as they at present exist in their different sections. The only historical point of view which I may venture to take, and which is quite indispensable in order to form a judgment on the real state of things among the different tribes, is, that I shall notice, as far as possible, the conditions under which they have settled in the various parts of the so-called Great Desert, or Sahrá.

This desert is at present known to be not, as had long been supposed, a sandy ocean without vegetation, and unfit for organized beings, but rather a rocky wilderness, sometimes indeed stretching out into an almost uninterrupted level, covered with pebbles or with gravel, but as often undulated with ridges and valleys, certainly not bountifully endowed by nature, but nevertheless furnished with vegetation enough to provide for the camel, that useful animal, which, in the Targie or the Temáhirg tongue, has been most expressively combined with man into one idea, man being called *alis*, and the camel *amis*. Indeed, except in some favoured spots, where the date-tree grows, and where corn or ghussub and vegetables can be obtained (of which there are some localities, "Wáhs or Oases," in the very heart of the Desert), man does not find in these districts adequate food for himself, and the tribes are obliged to fetch their provisions from markets situated on the borders of their spacious abode. The means for buying these they obtain either by robbery or from the tribute paid to them for the protection they give to caravans passing the difficult paths of the Desert, or from the hire they get for their camels, or from trade which they carry on themselves, and, finally, from the salt, which nature has deposited in immense quantities in different parts of the Desert, the most known of which are Bilmah and Dírkee on the one, and Tandénni on the other side.

Such being the character of the Desert, it is scarcely probable that it was unin-

habited before the arrival of the now ruling tribes of the Túarygs, which I suppose to have occurred about eight or nine centuries ago; and it is my firm opinion that the race, by which the whole western half of the Desert was inhabited at the time of the arrival of the Túaryg, were the *Imrád*, or *Imráth*, or *Meráthah*, with the exception of the country of *Asben*, which it appears was inhabited at that period by *Negross*.

The *Imrád* are a widely scattered tribe of the same stock as the Túarygs, but subjugated and degraded by these, which is the reason that the two names—viz., that of *Imrád* and that of *Túaryg*—are generally used in contradistinction to each other. The *Imrád* or *Meráthah* are not only found round *Ghát* and *Agádéz*, though these are their principal quarters, but they are scattered through the whole Desert, and a great many of them live amongst the *Hagár* and the *Sakomáren*. Though consisting of a great many smaller fractions, the whole body of the *Imráth* seems to be divided into four large families, which is certainly the case with those living among the *Askar*.\* The names of these four divisions are—the *Batánatáng*, called by others *Ibétatén*; the *Fárkanah*, or *Aferkenén*; the *Segigátáng*, and the *Wáranan*. Of these divisions, the two latter seem to live principally in and around the small town of *Bárahát*, a few miles S. of *Ghát*, in a beautiful forest of date trees of considerable extent, and in and around *Yanet* or *Ganet*, a place consisting of the three villages of *Selwas*, *Agáhi*, and *Elmehán*, situated in a fine favoured valley with running water, of which the richest is called *Efért*, about 30 miles S.S.W. from *Egert*. These two favoured spots of the Desert seem to be left entirely to these people as to tenants, under the condition that they have to take care of the plantations and of the gardens, and to collect the fruit, of which they are obliged to give a portion to their masters. Some of these (for instance, *Sidi Tafel Ueled Sakhátá*, who was reported ready to make a razzia against us) seem to have a great many of these people at their disposal. The *Batánatáng*, or *Ibétatén*, reside principally in a Wadi called *Teslit*, while a part of them have their abode amongst the *Hagár*, in a district called *Tehellahóhet*, on the road from *Asín* to *Túat*. The last tribe, viz. the *Fárkanah*, or *Aferkenén*, dwell in a Wadi called *Tarat*, about a day's journey N.W. from *Ngakell*. Besides these four great divisions, there are many other sections of the *Imrád*. The names of these are as follows:—The *Dig-Súrkí*, in the territory of the *Askar*, in a place called *Edéthí*; the *Kel-entunán*, living in *Aderar*; the *Amárlélen*, who have their abode in the same spot; the *Kel-áhenet*, living in *Hággara*; the *Akeshemáden*, in the Wadi called *Atúl*; the *Ihelán*, who have their dwelling-places in *Zerzer*; the *Kel-rájsa*, in *Isak*; the *Kel-ists*, in *Temárraset*; and, finally, the *Jrán*. In addition to the above mentioned sections, there are the numerous tribes of the *Imrád*, scattered about in the valleys around *Agádéz*, and described in the foregoing chapter; of these I made out the following names, without being able to assign to them any certain abode:—they are the *Eherheren*; the *Kel-tshisem*; the *Taranájt*; the *Edárreban*; the *Iovúswozan*; the *Efelén-gras*; the *Ehettén*; the *Turi-wáza*; the *Ihtagemángh*; the *Egemmén*; the *Edellén*; the *Kel-tédale* (the three last are closely connected with the *Effedayeh*, of whom I shall speak afterwards, and participated in the razzia by which our expedition was stripped of a great deal of its property), and the *Ikhóhanén*.

The Túarygs, strictly so called, although distinctly separated into several large families, are often opposed to one another in open hostilities. Nevertheless, there are many instances of sections of one family having settled amongst those of another, the most striking example of which kind of transmigration is that of the *Ifogas*, who, belonging as they do to the *Askar*, are scattered at present amongst the *Kél-owis*, as well as among the *Hagár*, only a small portion of them remaining in the territory of the *Askar*. In general, however, the different Túaryg families keep separate; and though their boundaries in such a land as this might seem difficult to define, they nevertheless have a fair idea of their territorial rights.

Before proceeding to describe the different groups of the Túarygs, I shall mention some names supposed to be those of tribes which are entirely derived from the Arabs. The first of these is that of *Túaryg el ba'dah*, or *Túaryg el bea'd*, out of

\* The meaning of the name of *Askar*, according to the *Tenlikum Ibrahim*, a rather intelligent person, is the same as that of the word "taiwál"—submissive to authority.

which there has been formed, somehow or other, the name of a tribe unknown in this part of the world, viz., that of Túaryg el abiadh, or the white Túarygs,—a curious sort of composition. But Túaryg el abiadh is nothing but a general name, under which the Túátis comprise *all the wandering tribes of the Túarygs*, in contradistinction to the Kel-owis, *who live in villages*. The second of these names is that of *Harár*, by which I was myself led into an error some time ago, supposing it to signify a distinct tribe, as I had been positively assured; but Harár is nothing but a general Arabic name for all the *free* people, in contradistinction to the Imrád.

The families of the Túarygs, reckoning from N.E. to W., and then to the S.E., are as follows:—The Askar, the Hagár, the Sakomáran, the Avelimmiden, the Kél-geris and Itesán, and, finally, the Kél-owis.

The Askar, or Azkar, who occupy the great portion of the Desert from Ghát westward as far almost as Túwat, and southward as far as Asia, from which point their imaginary frontier runs in an angle, until it reaches the westernmost extremity of the northern line just mentioned, have become well known during the last few years. There seem to be five great divisions of this tribe, which, as I learnt from different quarters, is able to bring into the field a force of 2500 men mounted on Meheris, and about the same number of men on foot. The portion of this tribe which at present possesses the greatest strength and affluence are the *Aurághen*, the greater part of whom live in and about the valley of Aríkum, on the direct road from Murzúk to Súdan, and about 50 miles to the S. of Ghát.

The tribe that formerly possessed the greatest authority, and which on this account is still called *Amanókalen*, or the Sultan tribe, is that of the *Imanang*, who are at present reduced to extreme poverty, and are generally in the Wadí of Díder. The third tribe, to which belongs Hatítah, the friend of the English, are the *Marásatán*, or the Imarásatén, whose leather tents are pitched in the valley of Zerúia (Tserwa), on the road from Ghát to Túwat, about six days' journey from Ghát.

These three tribes constitute at present, strictly speaking, the community of the Askar, two other divisions, viz., the Ifogas and the Hadánarang, having separated from the principal body. One of these, the *Ifogas*, are scattered over the whole Desert, a part of them having settled among the Kél-owis, at a place called Tórit, on the road from hence to Damergú; while another section is settled in the more favoured valleys to the eastward of Mabrúk. But a small portion remains in the territory of the Askar, where they have their abode in the valley of Afarah, about half-way between Ghát and Túwat. The second of the tribes, viz., the *Hadánarang*, is settled in Ademar, not far from the southern frontier of the territory of the Askar, in the midst of the Imrád. They are, to some extent at least, migratory plunderers; and to them the freebooters belonged who recently murdered two Tibbaní merchants on their road from hence to Ghát, carrying away their whole caravan with no less than thirty-three slaves.

I did not succeed in obtaining all the names of the subdivisions of the larger families, called *faiah* in Tarki, of which I was assured by Hatítah himself that there were not less than thirty. The four I succeeded in obtaining are as follows:—The *Izobán* and the *Okaeren*, both living in the Wadí Ir'áranén, and probably belonging to one family, viz., that of the Imanang; the *Dégarrah*, probably a section of the Hadánarang, living in Tarát, together with the Imrád and the *Iháwen*, or *Ihéwan*, a portion of whom live in Titarsén; while another section has settled near Tasawah in Fezzan, forming the last link of the chain which connects the Imrád and the Askar. Another link is formed by the *Makéresang*, who, like the former, submit to the authority of the Nakhnikhen; then follow the *Ifélelen*, who are settled in Tasí together with the Imrád. The least degraded of these outcast tribes is said to be the *Matertélen*, whose kindred certainly belong to the Imrád; but who are now settled in the Wadí Gharbi in Fezzan. Another section of tribe, mustering about 400 men, half of whom are armed with guns, influences greatly the commerce of the Desert. This tribe, the *Tentikum*, on account of the respect they enjoy as a sort of Merabetín (they having adopted the ascetic dogmas of a holy man from Medinah, whose Zániyah or cell is a few miles W. of Masráta), is able to carry on almost undisturbed the commerce between Fezzan and Súdan, or the Negroland. To this tribe belonged the people with whom the expedition travelled from Murzúk to Air, and who by their social character have been of the



greatest use to the travellers, in making inquiries respecting the Desert and its inhabitants, and are partly settled in the Wadi Gharbí, partly in Tigger-odeh, called by the Arabs Tigger-wrtin. This village, situated about 20 miles to the W. of A ur-zák, and consisting of hashish huts called tekábbber, is their proper residence. where their sheikh or sultan—amanókal—lives.

In order better to understand the enumeration of the valleys in which the different tribes of the Askar are established; I here add the

*Route from Ghát to Tsertsuwah (Zerzúa) and thence to Ekert.*

In going from Ghát towards the W. on the road to Túwat, you reach, after four or five hours, Pút; on the second day you sleep in Pú; on the third at Atser Intáshelt; on the fourth in Azákken Temanókalt; on the fifth in Ihórhayen; after which on the sixth day you arrive in Zerzúa. From thence, proceeding S. and a little E., you encamp, on the first night, in Taent; on the second in Tin-túzist; on the third in Adómar; on the fourth in Aderar; on the fifth in Dider; and arrive on the sixth in the fine deep valley of Ekert on the Súdán road.

The Hagar, or Hágara, who seem to be rather more powerful than the Askar, having a force of 9000 men, mounted on mchera, occupy as far as I could learn, the whole western portion of this part of the Desert. They have been hitherto wrongly placed much too far to the N., being bounded on the S. by the Súrgú or Avelimiden; to the S. E. by the Kél-géris Tesáh and Inrád; and to the E. by the Askar and the Sakomáren. I was not able to ascertain their boundaries towards the W. This tribe, often confounded with the Askars, who are not only occasionally called Hagar by the Arabs, but often designate themselves by this name, is divided into six branches.—First, the Kél-árah, inhabiting the Wadi of Erárar (a general appellation for a valley plain); the Baghlan, living in the valley of Tefedist; the Tahná, inhabiting the fine Wadi Arak; the Tegehá-usidi, who have their abode in the valley of Ter áser; the Tánbá, who pitch their tents in the Wadi Tifnakéli; and the Idheyén, who inhabit Anímeggél.

The riches of the Hagar, who do not raise a tribute upon the merchants—at least not upon the Tuwáns—seem in a great measure to be derived from the salt of Tfidénní (not Taden), and they live almost entirely upon animal food, which diet accounts for their great bodily strength.

**VOCABULARY of the LANGUAGE of AGADEZ, which is the same as that spoken at TIMBUKTU and the Eastern part of BAMBARRAH.\***

At, Foz (Togghat), November, 1850.

In this vocabulary every word is written as it is pronounced, and I have made use of the following letters:—

a, b, d, e, f, g, h, i, j (= to the German *ist*), k (equivalent to the French *j* or *par*), l, m, n, ñ (= the Spanish ñ), o, p, r, s, s' (= to the English *s* in the word *seed*), sh' (the English), t, tsh, u, w, y, z.

All these letters are used as they are pronounced in German, except where the contrary is particularly stated.

BARTH.

Hausa.	Emghedesic.	English.
<i>Celestial Phenomena, &amp;c.</i>		
rana	wénu	suit
uóttá	hándu	moon
temráro	handu ro kaina kaina	star
bissa	bím	heaven
ghússum	astúán	South
aréua	aír	North
gábbes	elkúbla	East

\* Dr. Latham says that the Vocabularies of Barth agree with those of Hodgson, Denham, and Caillié, except that in Hodgson the numerals go as far as 10. See also Cooley's *Negroland*, p. 125, note.—ED.

Hausa.

Emghedesis.

English.

*Celestial Phenomena, &c.—(continued).*

yamma	táram	West
rani	auélan	summer
dámana	ári	winter
dáli	yéni	cold
s'áfi	kórno	heat
íska	híau	wind
hadderi	tshesuák	thunder storm
has'ú	ábakka	haze
rúan Alla	{ arrímmu irrin kónabi }	rain
haenia	eginnéuen	rainbow
rua	ári	water
haske	táffau	light
duffu	kúbaie	darkness
hanzi	honúketi	dawn
úta	korú	fire
háyaki	kau	smoke
hálishinúta	korú n deléng	flame

*Time and Seasons.*

látu	méraka	time, season
shékara	yéshi	year
uótta	hándu	month
deré		
rana	kani	day
yau	s'aes'eru	to-day
gobé	súbbach	to-morrow
jibi	bibi foéó	the day after to-morrow
gatta	gatta	the third day
tshitta	tshitta	the fourth day
jia	bí	yesterday
shékaren jia	bibi fo arósen	the day before yesterday
shékaren baná	gírí	this year
shékaren bára	yéshi ro iúokkei	the last year
shékara bará utshen	yéshi ro ténénat	the year before
shékara me sákkua	yéshi ro koeiketi	the next year

*Degrees of Kindred.*

mutum	baro	man
motane	baréu	people
meji	aru	man, husband
matshe, pl. mata	uei	woman
obá	baba	father
ná	nana	mother
kaká	ankáká	grandfather
iaýé	béré	ancestors
nána	am béré	elder brother
kané	an kaína	younger brother
yáta	ambére aróé	elder sister
kánnua	an kaína(a)róé	younger sister
jínjeri	aberí n gúngu	embryo
jaríli	is'akaína	baby
da }		
yaru }	is's'e	{ son
dia }		{ boy, young man
bodérua }	is'aué	{ daughter
ráffani		{ girl
dan kané n ubána	annana kaína	uncle
	am bába n kaína	cousin



Hausa.	Emghedesic.	English.
	<i>Actions and Feelings, &amp;c.</i>	
rai	áfuna	life
haifudáta	s'areji	birth, birthday
mutúa	buëo	death
gaua	edók	burial
koscheüa	tassákóot	grave
	asakkónsokó	cradle
	ádduba	wedding-meal
bekí	kigi	marriage
amré	haiánhar	business
abiñi	anhaia	matter
abiñna		government
sarauta	kokeu téré	installation
		custom
hali	borújja améha	service, occupation
aiki	goi	present
kiautá	náse	bondage
bautá	ameshé	feast, religious
salla	gíngeri	great feast
salla léya	gíngeri béri	joke, amusement
urgí	húr	play
uása	húr	dance
raua	gáni	music
gogé	anzel	mirth
murna	gúrgur	anger, wrath
fúshi	akornó	dream
mafalki	hánderi	word
magana	kí	meaning
tarin	aibai-kí	honour, glory
yabó	addúta	shame, infamy
kúmmia	ahaúí	mind, intellect
hànkali	[amai]taieti	will
dúnka	anbán rosó?	memory
túnaua	hánguoi	peace
sañi dádi	koreme elafia	quarrel
fádda	esók	single combat
fáma	bore' inka 's-ók emégger.	war, expedition
yáki	oóngú	illness
tschiúa	dori	fever
masasera	urkí	small-pox
zénzaná	badani	wound
yánki	adúngua	medicine
mágani	súfari	tattooing
schaschaua	kekés	

*Tame Animals.*

bissasché }	tshimá-raua	domestic animals
dabobí }		
rakomi, pl. a	yoëo, pl. the same	camel
tagua	yoëo üai	she-camel
dan tágoe	sáka	young camel
girki	áfarak	herd of camels
sa, pl. sháno	hauí, pl. hauío	ox
sánia	r'oi	cow
takerkeri	as'agéri	ox of burden
dokí, pl. dauókkai	barí, pl. barío	horse
jaki, pl. jauókkai	fárka, pl. farkaio	ass, donkey
jaka	fárka uai	female ass
alfáddara	afákkarau	mule
rago, pl. ragona	figi, pl. figío	wether, ram
túmkia, pl. tumáki	alákka, pl. telëo	sheep

Hausa.

Emghedesie.

English.

*Tame Animals—(continued).*

akunia, pl. auáki	hánkeni, pl. hankenio	goat
búns'uru	as'ólak	he-goat
{ kársaná	tarút	she-calf
{ marekí	áru	he-calf
karé	hánahi	dog
músshe	mush ráru	male cat
kenua a musa	músh	cat

*Wild Animals.*

namendaua	géngen hámu	wild animals
beréua	as'ínked	gazel
mareia	tas'ínked	a larger species
s'ómo	tamarroát	hare
nianyaua	músh	fox
dilla	elfáki	jackal
{ s'aki, pl. s'akona	baba bére, pl. babau	lion
{ abe n daua	gengi n haia	king of the desert
giúa	hám róbere	elephant
uéluaíji	gengi n hauri	wild buffalo
rakomi n daua	gengi n yoés	giraffe
damússa	tshékhshar? naijak?	leopard
kúra	tas'óri	hyena
berí	auérkit, pl. úrkidda	monkey

*Birds.*

suns'u	kéran, pl. kerana	bird
kas'a, pl. kaji	gurango, pl. gurangaílo	fowl
kúrtshia	arókidé	wild dove
tentábara	teddabér	pigeon
s'abó	táliat	guinea-hen?
fakara	keran	partridge
túturu	bífutu	hoopoe
maiki	ajadér	eagle
agulú	alrorúb	vulture
jimmená	taráí taráí	ostrich

*Insects and Reptiles.*

kujé, pl. kudá	hamení—ís	fly
sabberó	tadés	mosquito
kudá n s'úmúua	hámmeni, pl.—is	bees
tshirnáka	modedúkku	?
súza	taútuf	worm
kéatshi	tanéglit	ant
komá	nóni	flea
kolkóto	gani	lice
kadangeré	rantálla	lizard
matshíyi	gónshi	serpent
konáma	dai	scorpion

*Parts of Animals.*

útshia	tamákkal	tail
kafó, pl. kafoné	tanó, pl.—oé	horn
saii	ké	trace, footstep
gesá	gínda habí	mane
fufikke	furauí, pl. furauen	wing
musae	asúfuna	corpse
káshi, tos'óro	kaká	excrements, dung

anasa.

Baughdris.

English.

## Land and Water.

kasa	gendá	earth, country
ténere	arárar bébban	plain, waste
dútshi, duátsu	tánji, pl. tanjio	stone, rock
zéré	talámmedet	sand
kurá	ábakka	dust
sauni	tánji kaina	hill
túddu	égef	mountain
kogo n dutshi	gúsu	pass, defile, narrows
koráma	as'as'il	valley, bed of a torrent
gulbí	ars'ar	river
mogeji n rúa }		water-channel
idanu n rúa }	moës	sources
rjia	bángu }	
ráfi	áfarak }	well
dáyi	géngi	desert
daua	tugújio	wilderness, forest

## Vegetables, &amp;c.

itshe, pl. itatshe }	tugúji, pl.—is }	tree
itátua }	ikéuan	trees, plants
seáa n itshe }	hánga, pl. hángaio }	root
sebga, pl. seháji }	tugúji n hángaio }	branch
kúnnua }	tugúji n iss'eo }	foliage
jaíen itatua }	koralyo }	fruits
furé }	bíbbéo }	blossom, flower
irri }	tákkuai }	seed
goreba }	tés'ak }	doom
abánga }		suwák
talba }	tabóra }	tálha
addua }	tagalellít }	?
graffen }	dané }	?
krúnka }	súbu }	hashish, herbage
tshiaua or hakkí }	fari, pl. fario }	garden
góna }	haini }	victuals
hatshi }	haini bíbi }	ghussub
géro }	áborá }	ghafúl
dana }	mó }	rice
shinkáffa }	ká }	vegetables
gañe }	kánkana }	melon
gúnna }	tagalélle }	wild melon
ja n gúnna }	hael }	molukhia
mía }	korúsh korúsh }	cucumber
korúsh korúsh }	garuai }	date
debíno }	tókkoi en is's'eo }	fruits of the doom-tree
yaíen goreba }		

## Food and Cookery.

abínshi }	uánha }	food, aliments
tshíma }	ari }	water
rua }	tásu }	bas'een
túo }	haiángoi }	dish prepared of beans
tubáni }	mása }	sort of cakes, pr. of ghussub
uena }		
fin káso }	goi in haia }	sort of cakes, pr. of wheat
s'úmua }	danai }	honey
madera }	húa }	fresh milk
nóno }	iu }	sour milk

Hausa.

Emghedesé.

English.

*Food and Cookery—(continued).*

gía	motó	sort of intoxicating beverage
maí farí	gi korai	butter
tshikó	gáshi	cheese
naama	hámu	meat
kilis	koró	dried meat
rómo	éshem	broth, soup
koi	góngori	egg
gishéri	kiri	salt
barkonó	ándahúr nummočo	pepper (black)
kanuá	sóso	natron
kólli	tás'er	collyrium
fura	kauf	a beverage made of crude ghusub
etatahi	tugújio	firewood
garuáshi n'áta	dengió	fire-coals
tokónia	kusú	kitchen-pot
marúfi	fendú	cover
madankí	dokúnha	handle, ear
akoshi	tú	plate of wood, &c.
kóllia	gásu	drinking-bowl
turmi	háamberu	mortar for pounding the ghusub
tabária	haegi	pounder
lúdde	ámola	large wooden spoon for drinking
tshákalu	kérau	spoon for eating
jirgí	aglel	large wooden bowl for watering the animals

*Apparel.*

tófa } rígá }	túbbelú	dress
tóggua } uéndú }	túbbelu kaina	coloured shirt from Súdán
fulá	urdú	short shirt
nédi (baki)	fúgla	trousers
rauani	tóbai	cap
zánni	hauánga	black cotton cloth wound round the face
uélki	súkumba	cotton cloth, handkerchief, shawl
takelmé	adegég ; honýnnu	light loose garment thrown over the riga
leia	tagmíó	apron of leather worn round the loins
eljíhu	sobbátó	sandals
talkhátu	tshira	sort of leather stockings
s'obé	anerjuf	small leather pockets worn round the neck
dúátsu	antalkhátu	pocket
karáu	kambáha, léngi	necklace
kárfi n'káfia	tánjio	ring
	isun dirang	pearls
	guru	ring worn round the arm
		ring worn round the leg

*Houses, &c.*

garí, pl. garúrua	kóra, pl. koraió	town
kauia	ariua	quarter, ward
	kóra kaina	village

Hausa.	Emghedesie.	English.
	<i>Houses, &amp;c.—(continued).</i>	
gida	hogú	house
kósi	hogeó	hut of hashish
fáda	hogú béré	palace
léma	korai	tent
daki	shigíffa	room
runfá	tajerá	shop
bissa gida	soro n bene	roof, terrace
soró	bene	upper story, tower
daki n soró	shigíffa n bene	terrace-room
tsakán gida	geré geré; or, hogú n nám-mes	court-yard
bángu n birni	agajir	town-wall
kófa	jokkotóta	pinnacles
	húgumme	gate, door

<i>Furniture.</i>		
gadó	karárar	bedstead
tabérma	asala	mat
killishi	áberuk	carpet
úka	tshélak	knife
áski	kiáb	razor
bótta	téibuttan	box
	bátteo	boxes
madobí; matsaukatshi	sokhóleén	looking-glass
mólo	danai	sort of violin

<i>Arms.</i>		
kans'ákkeli } takobi } úka } kubé } ratáya } hanún } máshi } kébia } baká } korí } gírkuwa } shirdi } shirdi n dokí } mashi n fidú } lekáffa } les'ámi } kararúaua } akomar }	tákoba tshélak hogú dokúnha bangro yégi tanó tagans'á korí korei gári gari bar' oenne áselis támar ar'aba anbairi n gurió nimbába	sword dagger sheath, scabbard sword-belt hilt spear, lance bow arrow quiver shield saddle horse-saddle shabrack stirrup bridle bells attached to the neck of the horse or camel saddle of a donkey

<i>Implements.</i>		
tanfassúa } annúra } s'aré } elmákashi } mabodí } makoblí } sendá } s'ummájia }	sana garsé tshemídes kerkábu nána búndu alauak	needle thread scissors key lock stick whip



Hausa.	Emghedesie.	English.
<i>Implements—(continued.)</i>		
fertaña haiua auartekki miko kugia laujé gátari egia egia n kába	gurú  gurú subú ndu nbóha tás'uf karfó kóngo	hoe plough tongs sledge-hammer hook-plough chopping-knife axe, hatchet rope rope made of the leaves of the doom-tree
s'ánfo yéka raga séika takrufa	s'ánfo el kúrrus elminjéf abiak ameital takeráf	pannier, basket bag of leather net water-skin provisions-skin a bag made of the leaves of the doom-tree
gugá sérka kúsa	gugá asísser tshikáffaten	bucklet of leather chain nail

*Metals and Articles of Commerce.*

haña tefárki túrba fatautshi guserí airi tákeref kaya	hinníberi  aus'ulu amíttel aier tákeref kaya	{ road, way path journey provisions caravan from the south caravan from the north luggage merchandise money } purchase with things } the pack, bale piece (of cloth, &c.) borrowing credit, debt gain, profit
kurdí kárba kómshe sundá rámta bí ríba	nagnrio jeníkaté kumús bundú waraye asbenis ahángani rúbbakh	
sináris ás'erfa kárí ja n karfi ersás délma	úrag ás'uruf gurú gurú kiddé éldem gani hadíd esséni	gold silver iron copper lead zinc iron-plate
gúshi ábdéga fari alkamara kórnu kírígi kaya n kámshi hauri n giua dónko maauni sáú	bábu gane korai korún-korún kuru tállat giu n éshenan fu tautuf ké	wool cotton cambric fine coloured leather bullock's hide essence, perfume elephant's teeth wax scales, weight ell

Hausa.	Emghedzie.	English.
	<i>Conditions in Life.</i>	
írri n móthane	borés n kení	<i>nation, tribe, set of people</i>
serkf	kokoi	master
babá n serkf	kokoi-beré	<i>Sultan, king</i>
béban serki	kokoi kaina	chief of the eunuchs
serkf n turáúá	kokoi gerégeré	the Kaid of the Arabs, prop. the master of the country and the Kaid of the Imrád
	tágas'a	judge of the market
serkf n kasua	jobú n kokoi	landlord
bobá n gída	hogú n beré	father of the family
obá n giji	ankoi	landlady
úá n giji	auguoi	slave
baua, pl. bai	baina, pl. bainéó	son of a freed slave
shushán	aroi hai	master of the slaves
serkf n gandó	áfari n kokoi	servant
maai ki	hogú n á'goi	countryman
da n garí	korá n is's'é	stranger
mutum n ka uge	géngi n beró	the Arab, the white man
ba-túre, pl. turaua	el r'arab	<i>friend</i>
aboki	ánkere	guest
bakó	amágar	enemy
tauai	iknéua, pl. iknéuenyo	<i>herdsman</i>
mai-kiaii	kút-koi	sportsman
faraúta	koi géngi	marksman
ma-hálbi	bir-koi	fisherman
makami n kifí	ajeni kifí	peasant
monomí	akoi genda	merchant
tajeri	elmang-koi	retail dealer
mai-dukia }	dir-koi	traveller
mai-tállá	akkoi Súdán	blacksmith
ma-fataútsbi	aenet ('Targh.)	tailor
ma-kerí	tatáb-koi	saddler
me-dímki	kurú nge koi	shoemaker
me-kélagai	tár'mu koi	builder, architect
me-takéime	hogú nge koi	beggar
mai-gínni	kímbo-koi	strumpet
mai-róko	waiyó	juggler
fárkura	gonshinshín-koi	wrangler
gérdi	s'ákhkoi	concealer
mai-s'ennani	elmonáfek	
muná-fekí		
rúdi	s'e-koi, pl. s'ekoaien	<i>thief</i>
baráú		
mai-sáta }		
máfasa	kom-koién	highway robber
damré	hígi	prisoner
dóka	dók	executioner
dógali	baina	hangman
karánta-ladán	karáng	<i>hire</i>
	<i>Miscellaneous.</i>	
rabori	afó	number, numerals
tas'ónia	maisatalólo	history, tale
emósa	hamnió	motion
motshí	mármur	noise
dúnkuli	kúnkuna	ball, spherical form
kusserúa	tár'mur	angle

Hausa.

Kamghedesié.

English.

## Verbe.

guddumaúá	há	help!
gáffara	narái darú	give place!
sonhai fene	hai	I am born
ina-da rai	a-funa	I live
nai sufa	ai-jian	I grow old
ina amré	ambék	I marry
nai da	ai-da n is's'é	I beget, procreate
na-haifo	ai-hai	I bring forth
na-mutu	ai-bu	I die
na-ga ni	ai-goná	I see
ina-yí	ammau	I hear
dubí imp.	hassai	look, imp.
ina shauraua	dénne hánga	I hark
na-tshé	ai-hár	I say, tell
naámsa	ai jini	I listen, answer
nai kurúm	ai rin rai, imp. danrai	am silent
ina tshí	akoi ná	I eat
na-dándana	ai-dús	I taste
na-koshi	mántu	I am satiated
in-shá	annín, pf. araidanín	I drink
na-bogu	ai-bokútta	I am drunken
ina guddu n daua	addán gungú n s'urú	I ease nature, prop. I hasten into the bush
ina kashé	addán kaká	I evacuate
ina fitsaré	hángara	I make water
nai amaf	ayer	I vomit
nai jebi	ai ua	I perspire
ina bertshí	ai kani	I sleep
nike kóntshe }		am sleeping
ina tashí	ai tunú	I rise
natseia dede }		stand upright
ina fitto	ai fonúketé	I walk, go out
ina s'ákka	ai-te	I come
na-shigga	ai húr, imp. nohúr	I come in, penetrate
na-tafí	ai koi	I set out, start
ni-s'áni }		travel
na-godú	ai-s'orú	I hasten, run, escape
nai kúsa	ai mánkete	I come near, approach
ina gúrgusa	mánngang	I draw near
ni níisa	a-koi, pl. ai to katé	I arrive
ni-kómo	ai katé	I return
na-batshi	ai dere	I lose my way
na-gaji	ai fargán	I am fatigued
ni-tecia	kai imp.	I stop, halt
ina-futaua	asúnfu	I rest
na jínge ná	goró	I lean back
nauárki	ai góde	I recover
ina-só	ai bara	I will, I wish
ina-só én-sea	ai bara ndai	I will buy
ni ia	araida	I can, am able
na-fi	ai-bissan	I am better, a greater person (than)
ina yirda	ai gishá	I am persuaded
ni-tuna	a-hánguói	I remember
nimeida hánkali	yejí taieti	I forget
na-mantshi	ai jinák	I take care, pay attention
na-sába	ai jendé	I am accustomed
na-sani	ai bai	I know

Hausa.	Emghedesio.	English.
	<i>Verbs—(continued).</i>	
ina-yí	amman	I understand
ina koiua	a-jende	I learn
ina koia masa	a-jenda se	I teach you
ni ina kedaia	a-keb	I reckon, count
na-krátu	a-karoi	I read
ina rúbbutu	ai kiteb	I write
ina ins'álla	ai gíngerí	I pray (to God)
nai rínsua	ai je	I swear
ina tsoró	ahámbarí	I am a frightened
inayín tshío	ammadóresén	I am sorry, sad, sick
nai fúshi	ai fus	I am angry
nai tausai	aimé-túmma	I compassionate
nai múrna	ai bárbéréo	<i>I am merry, glad</i>
ina daria	ai gúrgur	I laugh
ina kúka	a-hiau	I shed tears
ina uáka	á-ddun	I cry
ina urgí	a-húr	I make a joke, I play
na tuma	u-sad	I spring
ina rana	a-ganí	I dance
na-fádi	ai kang	<i>I fall</i>
ina-da	ai me	<i>I have, possess</i>
ni-ba (ka	nítten (araí	I give
ina kara	ai tunto	I give more, add
namaismáka	ai yejí nesí	I return you
— kau	atte s'auketén	I fetch, bring
nini as-á	surá (nga	I put down
ni daukí	doká (nga	I raise, lift
ni kama	atte jina (nga	I lay hold (of), catch
ina sekí	shilua (nga	I let loose, let go
na sabbás	s'umbú (nda	I take down, unburden
ni nikárba	attiji-níkketén	I receive, get
na ríki	atte kámba	I hold fast
nai néma	ai húrketén	I search, seek
ina bídda	mangúru	I look for
uima s'áni	raidakoi	
ni s'ámo	nukkuoi	I find
ni kóra	igatá (nga	I go on, lead on, lead away
	attesaiia (nga	I steal you
ni masa-sáta	ai derénder	<i>I lose</i>
ni nábatas	nidadaukatánga	I send
ni ina aiko	akiaua (ni	I call, call for
ina kjiirra	ai garánga	I meet
nai ishi	ai hánda (ni	<i>I ask</i>
natambaea	affojí (ni	I beg
ina róko		
na gódda	akíabér nesí	I show
ina n'úna	ahánga ni	I follow
ina bí	ángoka (kokoi bará	I am responsible (to the Sultan)
naríma (babán serki		<i>I obey</i>
	ai fer	I waste, violate, infringe
na-bia	manenénda	I am ready, wait for you
na-gbáda	abatáni	I thank you
ina jiránka	mánfergra	I offend, trespass
agai shekr	ínsa kakánderé	I forbid, prevent
nai laefi	ai gánga	I forgive you
	ai soruf nesí	I calumniate, insinuate
	uánen hámu	

Hausa.

Englishesie.

English.

## Verbs—(continued).

na búgga	ai bokúttá	I beat
ni kashi	akoi ianga	<i>I kill</i>
	kokey uibu	the Sultan kills
na-yánki	ai dúmbua	I wound
súna-yáikí	uõnguánga	they are at war
súntshe	irharánga	they are victorious
naba ts-oró	ai nasa hámbéri	I punish
ya fóre, 3rd p.	goíngi (kokoi)	the Sultan punishes
nú rama masada	atsebana-nésesi	I take vengeance on you for
		<i>I assist</i>
ni-táya	doká nga	I embrace
nai rúnguma	irkai endórrefu	I do good to you, treat you well
nai néggari taré daká	irredán hagóma	I conduct you
		I awake
eni makarakia	attedúmni	I bury
ni-tasás	attetuenúnda	I circumcise
na bísneshi	ai fiká nga	I exchange, barter
nia kátshia	ai yoelli	<i>I buy</i>
s'áni musaia musaia mení	akkoí baráí odéasi	I sell
nia naséu	ai de katánga	I borrow
nia naséis	dei(nda)	I lend
na ramta	ai fojíá(nga)	I pay
ni ramta	akkoí s'obuénnit	I owe (you)
niba da kurdí	attenán nagrio	<i>I begin</i>
bi nába shí (maka)	meraka)agnha adéré	I finish
na-fára	ai shínshi	I wait
nauanyé	mardebén	<i>I throw</i>
nai yéla	ai batúnni	I catch, take
na subás	ai muná nga	<i>I bind</i>
ni nátsheffe	ai jiná nga	I loose, untie, open
na damré	alhaná nga	<i>I aim</i> , take my aim at
na bodé	ai faerá nga	I kneel down
nahalbi	biránga	I shoot, let fly, discharge
na dúrkusa	ai segín	I pierce, stab
ina búgga	ai bokúttá	I miss my throw, the mark
ina sohá	sarai	I do not miss
ina kuskuréua	biránga; akumánga	
ina bashé kuskuréua	indabiránga; asukku- mánga	
		<i>I change my spot</i> , dwelling place
s'áne kaura	akkoí tení	I pass by
		I cross (a mountajn)
s'ane útshéua	akkoí yokai	I mount
ina kétare	ai sat	I dismount
nia énhau	bari(ó)egáng	I descend
ina sebka	s'umbú	I (am about to) swim
ina sásabó	ne s'ímúbúkkaté	I dress
ni ina lo	aibara ariga	I dress stately, put on full dress
inasá káyena	áddenán bangó	I undress
ina inyadó	tángarkoi	<i>I make</i> , do
		I arrange
na-túbe	aikaiánga	I clean
nai(shi)	aidaní(nga)	I wash
na-gérta	aigoéá nga	I dry
na-sháre	ai habá	I air, put into the sun
ina uonké	ai himmiá nga	I cook
ina kekashé	ai-kók, imp. akók	I allume, kindle, light
ina shenye	ai dará nga	
ina daffá	ai hiná nga	
ina bassa(úta	ai fonús (hor'ú	

Hausa.	Emghedele.	English.
	<i>Verbs—(continued).</i>	
ina furá	kau	I blow, blow up
ni kaahí	dabá nga	I put out, extinguish
ni tuffi	ai kúrkur	I burn
na kóni	ai baká nga	I break, destroy
na karié	imp. attúmuna nga	I pour in
ni subá	ammó (n arí	I pour out
ina yaia	daná nga	I turn over, upside down
ni jirgíta	aisakkatári	I draw water
na ja rúa	ai nání (yoéó	I give to drink
niba shá	taetés nga	<i>I pitch</i> (the tent
inkáffa (laema	kakabá nga	I take down . . .
inkádda (. . .	afasá nda	<i>I cultivate</i> , till
ni ina jñní (kasa	fika nga	I sow
ni ina shibka	moningi tugújio	I plant a tree
na shibkauna tshe	ashedaufngi	I gather, gather in, reap
ina tsara	añkí ngi	I store up, prop. I bury, hide in the ground
mabáni		I cut wood
nasára étatshe	akósí ngi	I flay, strip off the skin
ni naféde (shí	koi indá nga	I shut
rufé	addabá nga	I lock up
serkafé	akkainehín jedá	<i>I pound</i>
ina dákka	addút	I grind
ina níka	afufú	I stir up
ina dama	akurbá nga	I sew
ina dímkí	tatáb	I cut
ina yánka	dumbu anga	I rend, tear asunder
niatsbagé	koratánga	I divide, share
nirába	yebená nga	I measure, weigh
ni auna	nesá nga	I weave
na sáka	ni dánrai	I dye
na rinna shi	ai sílbi	<i>it does become</i>
— yakóma	arié aié	it must
— shina só	aibará nga	it is worth
— ya kammáta	atákindá nga	it is better
— yá fi	ábesá nga	it is useful
— akkoi ríba	arúbbakh abára	it is enough
— yai-sá	ató	that is settled, finished
shike-nán	inganóda	it is at an end, consumed
— ya-kári	abén	

*Phrases.*

guserimmo san-kári	irrenémmetél abéna	our provisions are gone
— akkoi	abára	there is, I have
— babu	ashíá nga	there is none, I have not
— ko akkoishí	kabara	perhaps there may be, it is possible
yaki yatshé	aiuángu	the victory is gained, the war devours
— ya faso	afakkód	the battle is lost, the war is thrown back
— shina tshio	addóri	— is sick
— ya-bátshi	akhasára	— is spoiled
— ya-nérki	amegádi	— does melt
— yayi doi	animmaia nga	— does stink
— shina da kámshi	ahumbu	— has a nice smell
— ya shiggi	ahúr	the rain) comes in

Hausa.

Emghedese.

English.

## Phrases—(continued).

ras ya shiggi da awen- nangida	ari hùrketehogù rókuna	the water penetrates into this house
auennannaua	memeiánga	<i>this is mine</i>
— naka	angáné	— thine
— nasa	angánaiki	— his
— namu	arundénni	— ours
— naku	indúenni	— yours
— nasu	ingóenne	— theirs
rua) shinagúddu	— as'urú	the water) is running
itshe) shina fíta	— akhonú	the tree) grows
— yánona	— ahiná	the fruit) is ripe
tokoná baynoná ba	almére áhina	— is not yet ripe, is unripe
— yéi señi	aié	it becomes cold
— ya táfasa	anás	it boils
— ya fúra	a-fonús	it burns
rána) táf ita	uénu honúketí	<i>the sun) rises</i>
rána) ta ádi	uénu káng	— sets
— shanági	— átunu	<i>the bird) is flying</i>
— shina-kérkaru	— ayáketén	the hen) cackles
— shinakára	— ahian	the animal) cries, bleats, &c.
— shina-rúori	— atússet	the lion) roars
— shinahábshi	— atússet	the dog) is barking
— shina-kiwo	— akút	the animal) is feeding
— shina-yín koi	— addán gungori	— is laying eggs
— yahaifo	— hai	— brings forth young ones
iná da rakoma biu	aima-yoé ínka	<i>I have two camels</i>
kaná da gida néggeri	aime hógu gumá	<i>thou hast a nice horse</i>
auennan mutum shináda	aro ború amé barí anúg- gumá	<i>this man has a nice horse</i>
doki neggeri	irremaí amutéI babó	<i>we have plenty of pro- visions</i>
munádaguserí deua	frremaí kokoí gumá	<i>You have a just master</i>
kunáda serkí maigáska	irremaí elma'm	<i>they have plenty of money</i>
sunáda dukia tári	ar wai ame gáshi de oénne	<i>this woman has cheese</i>
auennan matshe ta na da	abara n dénde	(which) she wants to sell
tshikó tana só taséissbi	núggenó yueo babó	<i>I see many camels</i>
nagani rakoma tári	aigonú tarai tarai	<i>you see this ostrich</i>
hagani auennan jímmaná	ró ború águna géndá	<i>he has seen Borno</i>
ya-gani kasa n Borno	Borno	
mú nga ni abokínka	irré gonú irri'nkere	<i>we have seen your friend</i>
kú nganí babá n serkí	irre goná kokoi bére	<i>you have seen the Sultan</i>
su nganí s'akona tári	irre gouá babá-beré babó	<i>they have seen many lions</i>
ni bá ka ranani néggari	nítten aré tobé gumá	<i>I give you a fine kerchief</i>
kai kabá ni sánia fodú	átten áni haú 'táki	<i>thou givest me four cows</i>
sófo) shi ba masá báí okú	árjono) átten ási baina	the Sheikh) he gave him
—	'íns'a	three slaves
matshe ta báni tshikó biú	wai ró anne rai gashí ínka	this woman (she) gives me
—	—	three cheeses
mu mu n káma girkinka	aijinín indingyóeo	<i>we take from you your camels</i>
kukuna ramta moná	indés'ibnet írresi mítékál	<i>lend us 3000 (cowries), we</i>
s'ambar okú muma-	ins'a irre yiókkai	<i>will return you them in</i>
isma kushi da Sínder	Sínder	Sínder
ni ina buggá nka	ni bukku s'uraf	<i>I beat thee</i>
ƙai kabúggani	attbukkutni	<i>thou beatest me</i>

Hausa.	Emghedeale.	English.	
auennan mutum	ahina	are ró abúkkutu wai ro	this man is beating that
buggata			woman
muna buggánsu		irri bukkat ingi	we beat them
ku kuna bugga mu		ingi bukkat aeri	you beat us
su suna buggá nta		ingidan bukkut ánga	they beat her

## Pronouns.

nia	arai(da)	I
kai	[né(da)kía	thou
shi	ínga(da)	he
ta	ánga(da)	she
mu	írre(da)	we
ku	índu(da)	you
su	íngi(da)	they

## Cardinal Numbers.

daea	afó	1
bin	ayínka	2
okú	ayíns'a	3
fódú	atáki	4
bier	hamsa	5
shídda	sitta	6
bókoi	sabá	7
tókus	temanie	8
tára	tshésara	9
góma	gáshera	10
goma sha daea	gáshera kínji fó	11
goma sha bin	gáshera kínji-ínka	12
goma sha tara	ascheriro áfo 'shí (prop. ashia)	19
asherin	asherin	20
asherin da tara	télatín áfo'shí	29
télatín	télatín	30
télatín da daea	télatín kínji fó	31
télatín da tara	arbaein áfo 'shí	39
arbaein	arbaein	40
arbaein da daea	arbaein kínji fó	41
arbaein da tara	hamsín áfo 'shí	49
hamsín	hamsín	50
hamsín da daea	hamsín kínji fó	51
hamsín da tara	settín áfo 'shí	59
settín	settín	60
sebaein	sebaein	70
sebaein da daea	sebaein kínji fó	71
sebaein da tara	temanín áfo 'shí	79
témanín	témanín	80
témanín da daea	témanín kínji fó	81
témanín da tara	tesaein afo shí	89
tesaein	tesaein	90
tesaein da daea	tesaein kínji fó	91
tesaein da tara	miet afo 'shí	99
ko dari daea bábu dari s'ongú	miet	100
debu-s'ambar	agi	1000
s'ambar góma	s'ambar gáshera	10,000
s'ambar dari	s'ambar dari	100,000



Hausa.

Emghedesté.

English.

## Ordinal Numbers.

nafári	isáren	<i>the first</i>
nabaia	ahinkaueni	the second
na okú	ahíns'aueni	the third
na fodú	atáki auenni	the fourth
na biér	hamsauenni	the fifth
na shídda	sittauenni	the sixth
nabokoi	sebarauenni	the seventh
na tókus	temániauíenni	the eighth
na tara	tesarauenni	the ninth
nagoma	r'asherauíenni	the tenth
nashadaea	ashera káji sóenni	the eleventh
naasherín	asherindéde	the twentieth
nabáya	bandaúenni	the last

## Adjectives.

hanzi	táffo	<i>clear</i>
duffu	kubai	dark
dayi	géngi	desert
daua	farúdaró	wild
shebkakaua	kornó	cultivated
safi	yéni	warm
seüi	kuku	cold
dogo	bére	high
dagirma	kaina	great, large, extensive
babá	arjonó	<i>great</i>
karamí	arjonó	small, little, young
kanánne	taliet	old
sofo	angueni	new, young
sabó	bángu	elder
nasa	akukú	deep
surúfi	adúngurá	long, high
detsháu	afaet	short
kajére	kitta	wide, spacious
dafádi	babó	tight, close
mas'utshe	ká	much, many
déna tári	gére	whole, all
dúkka	gére n gére	half
sáshe	ahinka-uénne	quarter, fourth
sashe n sashe	jebánga	more
na biú	tonánga	less
ragé	haikashén	full
tsheké	kátaran	empty, there is none
babu kómi	manó	few
kadánna	amúr	near
kúsa	águma	far
da-nísa	futú	good, fine
néggeri	ammegábi	nice
da-kiau	anmegábi	bad
mógo	elrafia	strong
da kárfi	dóri	weak, frail
bashe da kárfi	idúnbarai	safe, in good health
lafia	indaul	ill
tshío	hámbarí	wounded, I am
sunyankini	indem mó gumá	courageous
da sútshia	maufutú	coward, timid
tsoró		pretty, handsome
dakiau n fúska		ugly
mogu n fúska		

Hausa.

Emghedesta.

English.

## Adjectives—(continued).

tshio n s'úts'ha	ulin dóri	sad, mournful
yúngua	hére	hungry
nia yúngua	ni dadén hére	I am hungry
kishi n rúa	fát, ai fát	thirsty, I am
da hánkali	indataieti	prudent, clever
bashe	annemai taieti	imprudent
mai kókari	amai túnfa	clever, skilful
rúgu	an-nébesúk	stupid, foolish
mai haushi	akúrteni	impudent, bold-faced
mai yeuenroko	nikke fojembó	importunate
mogu n s'úts'ha	úlfutú	malicious, cruel
mai gáskia	ammai kimi	honest, true, just
da-kária	tan-rarí	false
hássada	uánhámu	jealous, envious
da-kiautá	amai tanáfo	liberal, generous
basche	anme tanáfo	illiberal
sádaka	tshikótana	charitable
mágadí	kaberéu bára	ambitious
dalíli	addalil	humble, submissive
ma-aiki	amai-gooi	active, industrious
ya-gaji	áfergrár	weary (he is
ma-káfo	assúgguna	blind
kurmá	ásumman	deaf
bashe magana	asékki	dumb, mute
dungú	kebáko	lame
nofí	hánshi	naked
mai kurdí	elmán-koi	rich
talákka	tálak; annemai haika	poor
shináda mata	amme uai	married (he is
baché daash'i mata	anemai uai	unmarried
tamró	baró	
ta ná da tshékí	amai gúngu	with child (she is
ya sába	ajendé	accustomed (he
ya rima	agoka	responsible (he
da nauí	atshíng	heavy
basche	an-itshíng	light
da uia	} agéb	{ difficult
detsháda		{ dear
baché dauia	} anegéb	{ easy
da-dáma		{ cheap
ma-máki	elmussála	wonderful
gáskia	kimi	true
karia	tán-rarí	false
jíkkaké	mosanemó	humid
kekáshasé	kekasashé	dry
taurai	ashéndi	hard, dry
gúrbi	as'ás'il	hollow, concave
túddu	egéf	convex
dédé	eyígidda	straight, direct
kerkatátshe	alánghau	curved
ketúaye	aiag le	round
mai kússèri	tágmur	angular
ánona	ahiná	ready, ripe
dañéne	} atáí	{ unripe
deñe		{ green
tshéké	tonánga	full
babu kómi	haikashén	empty
daeyana	a'ó	alone
taré	irhánga	together

Hausa.

Emghedeé.

English.

*Adjectives—(continued).*

da-kaifi	ai-uél	sharp
da dauda	amai jibi	dirty
bashe da dauda	anemai jibi	clean
erraf ia	erraf iar	fine
fari	korai	white
baki	bibi	black
rauca	érara	yellow
ja	kifde	red
déffoa	súbu	blue
tshángua	firiiji	green
éikas	élgas	green
dádi	kanó	sweet
dátshi	hornó	bitter
da gisherí	kiri	salt, briny
tshámi	amót	sour
deáji	akornó	strong, well seasoned

*Pronouns.*

uónnan	aró	<i>this</i>
uéntshan	aróssen	that
	uáni	a certain (m.)
	taméndem	a certain (f.)
kana	honúnnu	somebody
nannéne	maaiiki	who
uoddána	uóddan indánga	that, which
me	baki	what
har	hárrasén	also, even, himself
ko ónne	ma-hóka	every one
da junánsu	endénkerafen	amongst each other
osí-osú	afóyo-afóyo	some, others
naua	mérgi	how much

*Adverbs.*

daganán	engéffo	<i>here</i>
dagatshán	affoe-ússen	there
dáma	kámbe aro-issúa.	to the right
hanún hogú	kamba auénni	to the left
kabá	kóngo	straight on
ina	manánga	where
urínda	dóro	where (rel.)
bíssa	béne	on, over
kérkashé	kidé	under
kabá	ijínánga	opposite
báya	bánda	behind
kétare	sat-ánga	on the other side
kusá da	manó	by, by the side, close to
tsaká(n)	gerégeré	interior, in
tshikí(n)	ammas	between, among
uje	tárar	outside
kéuáje	lóngusu	round, round about
yens-ú	márda	<i>now</i>
yautáhe	} el mére	{ just now, instantly
tokoná		
kúllum	kúllum	not yet
dafáli	is'áren	every day
sodaea	kae fo	before, once
		one time

Hausa.	Emghedesie.	English.
	<i>Adverbs—(continued).</i>	
koi yaushi	alúka	sometimes, always
dadaí	kalá	never
yaushi	{ ménde fú	} when
	{ alár-fú	
so naua	íngi margé	how often
kaká	masó	how
kaká kakí	sandín kiné	how do you do
kamán	asauen da(ró	as
déde	ígedá	like
da-sónsa	indémbara	spontaneously
da kárfi, tilis	nittedanínga de gáli	by force
taré da	irhánga méfandan	together with
bashi da shi	ánnemai ánga	without
hákkana	minjída	so, in such a way
tó	índasa	yes, well
mm bahakkana	ánneki manjída	no, not so
domé	mikínga	why
domífa	aróm moga	because
mas'á	tambá	speedily, immediately
sanú sanú	másu	slowly, gently, by degrees
kadán kadán	kaina kaina	slowly

## THE PRODIGAL SON.

## LUKE XV.

Hausa.	Emghedesie.
Akkoi wonni mutúm shi ná da yaya biu.	Boró fó barénnu amai is's'e 'ínka.
12. karamí tshikí nsu yatshe da obá, bani rabi ndukia da ya fáda garéni. da ya ráha masu dukia-su.	kaina barí ngi babá kení, narai élna nín gére is'e kanéga. ajabín nísá íl má.
13. báya koánáki bábu deua karamí da ya tara abúbuwa dúkka yatafi garí danísa nan ya úatshe dukia su yayin shahilitshi.	bánda núgguma kaina ashídda ubajé ká akkoi kóra n moró ennóda ase saein elmá.
14. da ya gbáda dúkka akkoi babá n yúngua ga garí nan, da ya fára rashi.	ga haiyishiánga asaese il má, haere bebe abangánga korá jíkona gashínshi gíanis's'e akkoi kóra-fókona adánna-afúso sófari borefó kora júenni adauánga anfarí kuná an kótíó el khans'ir.
15. da ya taf í yáyi sufari kánsa ga uónni mutúm na garí nán da ya aika sa tshikí n gonáki sa shiyi kíwo n gurusúnai.	ahúr antónnan gúngu en dal elrárabaro en is's'eo iuá el khans'ir inhámu anuis'ánga is's'e yákatén anbangrosén. baena ánguéni anbában im mai wuábabó, ai bonún da haere.
16. shina guri shitshika tshikí nsa da yayen doraua uód da gurusúnai su katshi.	ántonán koi ambába daró, níbbará núnguá mefónda aiden as'enúfó írrin koi daró índenán mángina.
17. da ya-kómo gakánsa yatshé baua naua ná obána, suná da masa tari, ammani ina namutu da yúngua.	isúkkoi keroi séndán en is's'eo ning ni jaraí sende fó nem baineó kuná.
18. ni ítashi ni ítafi ga obána ni itshe dashí oba nayi sunúfi ga Alla da gaba garéka.	akkoi atambába daró, amúr ambába gonánga amau entausési as'oru akauán angindá kuná áloakánga.
19. ba n kúmma kammáta ba akyirra ni da nka kayini daea ga baruá nka.	
20. yátashi yasákka ga obá nsa da shike nisa obá nsa yaga nása yayi tausai yayi gúdda ya fádi ga uyá nsa ya lédsasa.	

## Haussa.

21. amma da ya tshe da shi oba naye sunfi ga Allah da gaba gareka ba n kumma kammata ba akyirra ni da nka ba.
22. amma oba yatshe da baruá nsa, ku kau riga néggeri, kusa masa da ku sa masa sobe ga faritshi nsa da takelmé da kafáfu nsa.
23. kukau kibbatátshe marakí ku kashí shi da mutshi mu yi murna.
24. dong wouga dána ya mutu da yayi rai kúmma da yagbatshe da ánganéshe da suka fara murna.
25. ámma úa nasa shinatshiki n naki da yakómo yayi kúsa da gida ya jí bushé-bushé da raua.
26. da ya kyirra daea ga baruá, ya tamba sa mi uoddán ga abubua akkoi.
27. amma ya tshe da shi kané nka yasákka da oba ka ya kashi kibbatátshe marekí dong ya sama sa da lafia.
28. amma yayi fúshi da ba shina só yashigga ba. oba nsa fa ya fitto ya kjiirra shi.
29. amma yaamsa yatshe daobánsa dubí, shiékaru naua inaji maka barántaka dadai inagbada duka nka ba kabáni da n akua ba dong enyi murna da abokai na.
30. amma uonnan da nka uonda ya gbáda dukiáka ga farikuna ya sákka ha ka shi ma sa kibbatátshe marekí.
31. amma ya tshe da shi. da' kana taré da ní da komi naua naka ne.
32. amma ya kammáta yi murna da gudda, dong kané nka shi ya mutu da yayi rai kúmma da ya gbáda da ánganéshe.

## Emghedesie.

is's'e kená se aidenu as'enob ambábad írrinkoi daró indenan mánginá daró isúkkoi kerof sandán en is's'eo.

baba kénan baínese s'au kete tíbbulu gumá dánase tíbbulu dánase anáded kona léngi dánase tagmes an kéio-kuna.

s'aukete hauri ro gumá oíánga írrin uai írrin kúluf.

ánnes abún amma áfuna' ga dere goná nga ishínshi kúluf.

am bere bara faré kuná ga yakate hogfí n gére ammó funús funús yosé indég-gainí.

akiau kata baina ahándanga mi kíóki aróha.

bainakená sé' ankaina nin kai nete nim bába aui aru máninte danga kumá nga el rafia.

ammáu múrmurse asúk kul anhúr ambába n hogfí ambába honfí ketí kiauánga an is'é jení akenan bába-se. hásse giri maige ai-bara núngoí kuna attedán hairúnbará ka nisse kón araf hankí neji dangan ai kúluf mefan-dan an keraien.

nen is's'e ro aróennen da nún elmáng uaiyó daró até masonú yasé aru ma ninté.

ambába kéné se' dúngane handángaré agnóenne ka nún oéuaikí.

atákken díru kúluf affo, annín kain' abún ga áfuna ahúnna ga dere irré-goná katá nga.

## THE LORD'S PRAYER.

obá mu wonda ke tshikí n bíssa; suná nka shi is'ámma keáo keáwa; sarauta nka ta na sákkuá; yirda nka akayi kamán tshikí n bíssa hákkana tshikí n dunia.

bamu yan tshima da kulum.

yafe mamu sunubaimu kamán damu .kayáfe masú woddánda sukayi mamu sunubai

kádda kakaimu tshiki n rudi amma katshiei tshiemu daga mugu.

dong sarauta takatshe da alborma da haske har abada abada amin.

írrin bába ro bere béne númma atíkkí ka nynko koitere.

nyn tamáro róbere béue, minjída dúnnia koná.

nírua s'áes'eru ua n el kúf.

abesire yafimu írrinkoi nensurufurusé irrenaes'enu maseró írrisuruf.

írrínkoi yogasíri d'ebberó futú.

danga nynko koitere indanínne dareja har dynien tonú níkémboró.

## NOTES.

[This is a copy of the Answer which the Sultán of <sup>a</sup>Akadez sent to the Commander of El Núf, Lúsu<sup>c</sup>, and all the <sup>d</sup>Keilowis.]

In the name of God, the merciful, the compassionate. Prayer to him for the excellent Prophet, his family, and his excellent companions!

From the Commander, the Minister<sup>e</sup> of the Sultán, 'Abd-el Kádir, son of the Sultán, Mohammed el Bákiri, to the heads of the families<sup>f</sup> of all the tribe of <sup>h</sup>El Núf, and <sup>h</sup>Haméd, and Ceíy, and all those among you who <sup>h</sup>have large possessions, perfect peace be to you.

Your eloquence, thanks, and information are deserving of praise. We have seen the auxiliaries sent to us by your tribe<sup>l</sup>, and we have laboured diligently with them against the marauders<sup>m</sup> who impede the káfilahs of the poor<sup>n</sup>, and the frequenting of the road of those who travel and of those who remain at home. On this account we desire to receive aid from you against their incursions<sup>o</sup> [ghazáh]. The people of the Keil Fadayí t, they are the marauders<sup>m</sup>. We should not have forbidden their chiefs to exercise rule over them<sup>p</sup> except for three things: 1st, Because they will fly from Anikel to Wulumudun, [Wuldmudun, i. e. the Tribe of Mudan;] 2ndly, That they may not make an alliance with them against us, for they are all marauders<sup>m</sup>; and 3rdly, On this account, that you approve of this act of retribution<sup>q</sup> against them. Come then to us quickly. You know that<sup>r</sup> "what the hand holds [comes] from its following the fingers, for without the fingers the hand can seize nothing."

We therefore will expect your determination [to come], that is to say your coming after the departure of the salt [<sup>k</sup>káfilah] of the <sup>i</sup>Itisan, fixed among you [for] the 15th day of the month. "God! God is merciful and answereth prayer! Come therefore to us, and we will bare our arms<sup>s</sup> and drive away the <sup>m</sup>marauders, and fight valiantly against them as God (be He glorified!) hath commanded.

<sup>t</sup>"Lo! corruption hath multiplied on the face of the earth!" May the Lord<sup>d</sup> not question us on account of the poor and needy, orphans and widows, according to his word, <sup>u</sup>"Ye are all shepherds, and ye shall all be questioned respecting your flock, whether ye have indeed taken good care of it, or dried it up."<sup>v</sup>

Delay not therefore, but hasten to our abode where we are all assembled, for <sup>w</sup>"diligence is the duty of all;" or send thy messenger to us quickly with a positive answer; send thy messenger as soon as possible. <sup>x</sup>Farewell!

*Note.*—This letter is written in barbarous Arabic, and many passages may admit of different interpretations.

The names and foreign words are expressed in the Latin character, according to Sir William Jones's system of orthography, generally adopted and used in the Geographical Journal. It is very easily recollected, and enables the reader to pronounce the words correctly, and write them in the original character without difficulty or error. It consists in uniformly expressing each sound by the same symbol, giving to the vowels the sound they have in Italian, German, Spanish, &c., and to the consonants the power they have in English, except when no such sounds occur in the English language, as in the Greek or German *ch*, here *kh*, and those peculiar sounds to which ours only approximate, which are distinguished by a point above or below the similar letter, *q*, *t*, *s*, *n*, *z*, &c.

<sup>a</sup>Akadez, pronounced Agadez, is here seen for the first time in its proper form. None of the Arab writers hitherto accessible mention this place, unless it be Ibn Khaldún, whose history of the Beráber [pronounced Bréber] has just issued from the press at Algiers.

<sup>b</sup> Pronounced En Núf.

<sup>c</sup> Lúsu: perhaps it should be Lúsuí. The negroes generally point their Arabic words, and have rarely any knowledge of the difference between long and short syllables. The quiescent vowel letters are therefore usually omitted by them.

<sup>d</sup> As Dr. Barth writes Keilowee, he perhaps meant Kailowí; but we have Kélowee below (with a final vowel in the original copy), which seems to show Keilowí to be right.

<sup>e</sup> The Emír.

<sup>1</sup>The *Emín*. *Emín* is sometimes a proper name, but here it is evidently a title given to the *Emír el Núr*, Commander of the Tribe of *El Núr*, and a Governor or Viceroy (*Emín*) of his district under the *Sultán of Akadéz*.

<sup>2</sup>The heads, &c. Dr. Barth says in a note that this passage was rendered illegible in the original by having been wetted. The only difficult word in his copy is *kamíkík* or *kaşíkíki*, for which *kabilyát* has been substituted as an intelligible and possible reading, though *kabáyil* (spelt *kabyle* by Shaw) is the proper Arabic plural of *kabíleh* (tribe), the term generally used by the Berbers.

<sup>3</sup>"The tribe of *El Núr*," in the original *aulád-el-núr*, i. e. the "children\* of light," probably the names of an Arab tribe, or of the first Berber tribe who embraced *Islám*.

<sup>4</sup>Hamed for *Ahmed* is very common in Barbary.

<sup>5</sup>The word here used has been evidently mistranscribed. It probably should be *el mutakarrabín*, "the near neighbours," or "those on whom you have influence."

<sup>6</sup>Literally "from among your children."

<sup>7</sup>Literally "men constantly at war," i. e. the predatory Berbers who are always lying in wait for *káşilabs*.

<sup>8</sup>Perhaps *Fakírs*, i. e. poor pilgrims and santons.

<sup>9</sup>*Ghazáh* or *ghazát* is a sudden inroad, a *foray*, generally for the purpose of obtaining slaves. *gh* is sounded like the Northumbrian *r* in Barbary.

<sup>10</sup>This passage is obscure, and may perhaps mean "we should not have prohibited their ruling over their people."

<sup>11</sup>*Aljezi*, "their being compelled to make restitution," or perhaps, "their being punished as they deserve."

<sup>12</sup>A proverb which would probably be found in *Al Meidáun*.

<sup>13</sup>*Káşilah*, corrupted by some writers into *eaffla*, is the Arabic word expressing the Persian *kár-raván* now commonly used by the Syrian Arabs.

<sup>14</sup>The salt *káşilah* of the *Itisan* is the same as that of the *Keil-geris*, whose departure from *Akadéz* on its road to *Bilmáh* has been already mentioned. The *Sultán* of the *Itisan* himself sometimes accompanies this *káşilah*, and it seems probable that this name is mentioned on account of the higher nobility of this tribe, in preference to that of the more powerful *Keil-geris*.—B. *Itisan* seems from Dr. Barth's note to be another name of the *Keil-geris*, a Berber tribe. Were the word Arabic, it might be "al *tísán*," "the goats."

<sup>15</sup>The text here is doubtful. It appears to be *Allah a-l-m*, i. e. *Allah latíf, mujíb*, mystical letters prefixed to some chapters in the *Korán*. However, it may be *Allah! Allah!* "O God! O God!"

<sup>16</sup>Literally, "tuck up our sleeves."

<sup>17</sup>This is probably one of the *Hadíth* or traditional sayings of the Prophet, as it is not a quotation from the *Korán*.

<sup>18</sup>That is, neglected to milk the sheep that they may grow fat.

<sup>19</sup>*Jihád*. "Diligence in the advancement of religion." See *Korán*, ix. 24, 41. Sale's Version, p. 151, 155.

<sup>20</sup>Literally "Salvation be to you."

R.

### Second Letter from Dr. Barth to Dr. Beke.

Kanó, February 23, 1851.

WITHOUT stopping to give any personal news, which you will doubtless hear from another quarter, I proceed at once to acquaint you with the result of my researches at this place, which would indeed have been much more extensive, if my material circumstances, in conjunction with a little sickness, had not taken up a good deal of my time.

The present Sultan of the Fellani empire, or the *Emír el Múmenín*, *Ali ben Bello*, is represented as a man whose whole endeavour is only to amass riches—an

\* *d* has been accidentally omitted at the end of *Aulád*.

† These are under the special authority of the *Sultán*.—B.

example which is strictly followed by his officers. But as he never visits his provinces, and as the communication with them is very precarious, the governors are very independent, the office of some of them having even become hereditary.

The Sultan himself is said to be able to collect a force of ten thousand horse. The name of the present *Gedádo* is *Abdú*.

Among the governors, who equally adopt the title of Sultan,—1. The Governor of *Kanó* has the greatest power, on account of the market, which enables him to send ten thousand cowries daily to *Sakatú* for the household of the Sultan. The name of the present Sultan of *Kanó* is *Othman ben Ibrahim Dabo*, but his brother, the *Galadíma*, has in fact greater influence and power, so that in reality there are at present two Governors, each of whom requires a considerable present. The Governor, who is said to have formerly had a force of 10,000 horse, is now not able to collect more than 7000.

2. The second, as regards real power, after the Governor of *Kanó*, is, as I am informed, *Ibrahim ben Yakúba*, the Governor of *Booshi*, or *Bautshi*, who has his residence at *Yakoba*; for although he has a force of only 2000 horse, his troops of archers, the best known in Sudan, are numberless.

3. The third rank belongs to the Governor of *Zegzeg*, *Mohammed Sani*, who resides at *Zaria*. He has about 3000 horse, and numbers of archers. *Zegzeg* is a province of great extent.

4. *Loël*, the Governor of the extensive province of *Adamawa*, comes next, who has his residence at *Yóla*. Besides a large army of archers, he has a force of 2000 horse.

5. The next in power is *Hammedu*, the Governor of *Khadétscha*, who has a force of about 2000 horse.

6. Next to him is *Mohammed Bello ben Mallem Romáro*, the Governor of *Katshna*, with a force of not much more than 1000 horse. *Katshna*, on account of its vicinity to the hostile countries of *Marádeh* and *Gober*, has greatly declined.

7. Rather more powerful is *Abd er Rahmán*, the Sultan of *Katágum*, who is said to bring 1500 horse into the field.

8. Next to him in power may be considered *Yeríma Ahmedu*, the Governor of *Mesaw*, who is said to have 1000 horse at his command.

9. Then follows *Harder Lernima*, the blind old Governor of *Mármár*, who resides at *Nænwawa*; his former residence, *Birni-u-Gorno*, having been destroyed by the *Bornuese*. He is said to have about 700 horse.

10. The tenth rank seems to be occupied by *Ismaéla*, the Governor of *Shera*, brother of *Abd er Rahmán* of *Katágum*, with not more than 500 horse.

11. Then follows *Koránga*, the Governor of *Boberu*, having his residence at the place of the same name, with about 600 horse.

The 12th, and last of all, is the freebooting Governor of the ruined province of *Daura*, a man bearing the same name as the Governor of *Katshna*, *Mohammed Bello*, who, though he has but 400 horse, is feared by all his neighbours.

Besides these twelve Governors, who receive their orders directly from *Sakatú*, there is the Governor of *Zanfura*, named *Ahmedu*, who, as the cousin of the Sultan, enjoys almost the same rights as the above-mentioned persons. He resides at *Bakúra*, and is in command of a force of 3000 to 4000 horse.

In addition to the foregoing, there are still two important provinces belonging to the *Fellanis*, *Nyffi* and *Alyóri*, as *Yauri* is commonly called; but they do not, like the others, pay tribute to the Sultan of *Sakatú*, but to *Khalilí*, the Sultan of *Gondu*, and grandson of the conqueror *Othman dan Fodi* by his son *Abd-alláhi*.

The present Governor of *Alyóri* is named *Thita*. He resides at *Afasa*, and is able to bring into the field 5000 horse. The name of the present Sultan of *Nyffi* is *Masába*, who resides at *Ladi*, the present capital; *Raba* having been destroyed by the *Fellanis* about five years ago, when it rebelled against them. The Governor of *Nyffi* has about 2000 horse.

The court at *Sakatú* consists of nine persons. The next person after the Sultan, or Governor-serki, is the *Galadíma*, his first minister, and the natural Vice-Governor, a person sometimes of greater authority than the Governor himself. Next follow the *Sarkidawókki*, who has the command of all the horse in *Kanó*; the *Burda-n-Kanó*, the chief or general who leads the army; the *Al-Káli* or principal judge; the *Tshiroman Kanó*, who exercises the power in the southern part



of the province; the Sérki-n-Baye, who has the northern part of the province under his authority; the Gadó or minister of the treasury; and finally, the Sérki-n-Sháno, literally the master of the oxen: the oxen as the principal carriers of luggage in Sudan being an important part of a court or army in this country. When the Sultan leaves the place for any length of time, accompanied by his first minister and his captains, the Gadó and the Sérki-n-Sháno have the authority.

I now proceed to give a short account of the quarters and the gates of the town of Kanó, which Clapperton, though he made such a long stay here, has not, as far as I am aware, made known. In enumerating the different quarters of the town, I shall begin from the mountain named Dalá, the most characteristic feature of the town, at the southern foot of which the houses commence, stretching down towards the S. with very irregular outskirts. From this point I shall proceed eastwards, returning afterwards to the W., and so on. In this order the names of the quarters are as follows:—Dalá, Kutumbaw, Gérke, Mádabó, Yantándú, Adakawa, Koki Seta, Limantshí. Then turning S. to W., Yandóea, Jibjín, Yellabu, another Limantshí with a large mosque, Masukiáni, Túddum-Makerá, Yamrotshé, Mará-rabokoi, Baki-n-rúa, Runfawa, Yelluá. Next, turning again towards the E., Rimángirájiré, Mággoa, Maggogi, Unguankari, Déndali-n-Ware, another Limantshí, Dukkurana, Rúffogí, Déрма.

All these quarters are principally, if not exclusively, inhabited by the Habe, and they all lie to the N. of the Já kara, the ill-famed waterpool, which separates the southern half of the town from the northern; while the following quarters are almost exclusively inhabited by Fellanis:—Yaaléria, Mármara, Agadesawa, Yóia (the madáki-n-Kanó), El Kántara, Uaitákka, Goshériefé-Dodó, Tókobá, Dukkawa, Sághidárnse, Sháfushi; then, returning from E. to W., Shérbalé, Madaté, Kúrna, Sheshé, Dirmi-Kai-okú, Lelóki-n-lemú, Kólluá, Al Héndekí, Sorandinki, Rimi-n-Kóro, Tojí (where the palace of the Governor is), Yárkasá, Mańdanari, another Mármara with the surname of Dantúrku, Sabsansára, Kudédefawa, Jingó, Dossai, Warúre, Gau, Kurmawa, Hawsawa, Ungua Mákama, Galadántshi, Shurámtshi (where the elder son of the Governor, or the Shurómo, lives), Yesserkí, Kurmawa, Kusserúa, Udelawa (lying S. of the palace), Rimi-n-kerá, Káráká, Dugerawa, Yákasé, Nasserawa, Abdelawa.

The importance of these different quarters of Kanó is the greater as in some cases they are entirely separated from one another by the spacious places or the numerous quarries which interrupt the groups of houses. Of the whole character of the town, which is indeed quite picturesque and interesting on account of the number of palm and other trees waving over its surface, I will not say a word, but will merely mention the gates in the extensive town-wall, which, like that of Katsna and Zaria, leaves a very wide open space, in some directions two miles in extent, round the town. The names of the gates, going from N. to W. and round from S. to E., are as follows:—Kófa Masúger, Kófa-n-rúa leading to Zinder, Kófa-n-adáma, Kófa gudan leading to Katsna, Kófa Kansákkeli on the direct road to Šakátú, Kófa Káboga, Kófa-n-dúkania on the road to Zaria, Kófa gadáa Kaia, Kófa Kura leading to Katak, Kófa daagúndi, Kófa nassarawa, Kófa uambai on the direct road to Bornú, and Kófa mata. These gates are shut every night and opened every morning; while the gate called Tawáieu Kófa (the gate of the enemies) is walled up, because, as they say, a prince, who left the town by that gate, died, but, as the name seems to indicate, because the enemy—the Fellanis—made their entrance by it.

Subjoined is a register of the towns and larger villages belonging to the province of Kanó:—

Of Towns surrounded by an earth-wall, the houses being built partly of earth and partly of hashish, there are the following:—Jírma, Gerki, Sánkara, Yáfen, Rín-gim, Dúshi, Gaea, Gérko, Dell, Udíl, Tawra, Kura, Sákkua, Bebéji, Rimángadó, Dawáki, Godia, Bishi, Gezana, Zákeré, Killi, Maejia, Mega, Merke, Takai, Sangaia, Gogem, and Fanisó.

Of larger villages I learned the following names:—Ungógo, Dawáno, Zabenawa, Gezé, Wottari, Góra, Mádobi, Salanta, Ammágná, Dadi-n-dúnia, Gabezana, Doko, Quinkeálla, Dangaiame, Gurjana, Zóngo-n-Killi, Abegáni, Sákkua-n-Kombóto, Zángo, Gezi, Rafimálem, Rimen Asbenaus, Dawaki, Gano, Ranó, Ténneger, Kia-wa, Kaduawa, Takaláfia, Katákatá, Gazobí (a widely scattered village to the S.), Dausóchia, Gultí, Gani, Tamberawa, Dábassa, Gorzo, Karaie, Kafi-n-agur, Ruka-

dawa, Boda, Tarina, Fáki, Koki (towards the W.), Dawaki-n-Dambámbara, Katánkatángerawe, Katánga babá, Katánga Kárami, Katkazuba, Mallem-Kuiua, Bunkóri (with a considerable market), Kayánkásari, Tuddum Billané, Batsherawa, Yammáta, Demé, Deme-n-dankárfi, Tunfáfi, Kuddadefawa, Zango-n-Daandu, Paginkáw, Jajira, Tofá, Dangúgua, Zango mala andu, Jélli, Mádatshi, Mákodé, Konshi-n-guárta, Yakasé, Yóla. The order in which these villages are enumerated is round from the E. by S. to W.

### I. Route from Kanó to Adamawa by the way of Boshi.

1. The first day you arrive early in the forenoon at Sákua, a place situate on a running stream called Kogi-n-Sákua. In the morning you pass the village of Dawaki.

2nd day.—About *dhohor* arrive at Dell, a considerable place, larger than Tasa-wa, after having passed another considerable place, only a little smaller than Dell, called Gerko. The entire country is well cultivated, and there are but few trees on the road.

3rd day.—Shortly after mid-day you arrive at Parna, situated at the foot of a mountain by the side of a small rivulet. During the morning you pass a village named Gedia, between which and Parna there is some wood. Parna is not so large as Dell.

4th day.—Through a mountainous country covered with wood. At noon you arrive at a place called Tebki, the frontier between the province of Kanó and that of Boshi.

5th day.—You arrive early in the morning at Sabángari, a village situated in the plain. After having crossed a small brook near Tebki, your road lies through a well-cultivated country, where the people dwell in scattered huts during the rainy season, while during the dry season they retire to the tops of the mountains.

6th day.—You sleep at Saranda, a considerable village situated in the plain, at which place you arrive in the afternoon, after having passed a large mountain on your left. The country is well cultivated. Near Saranda you cross a brook.

7th day.—One hour after mid-day you arrive at Yakoba, the capital of Boshi, after passing through a well-cultivated country, covered with scattered villages. The town has twelve gates, and all around the country is extremely fertile; but there is no running water—only wells.

8th day.—About noon you arrive at Dutsi-n-Gére, a large village situated in the plain, by the side of a river which is said to run towards Gabbes (E.?)

9th day.—Arrive at Korállafa, a large straggling village, the Governor of Boshi not allowing the Pagans to collect close together in one spot. There are salt-mines here. The road lies along the valley enclosed by mountains on either side; but the country is well cultivated.

10th day.—In the afternoon you arrive at Garimmadáki, a large village in the valley-plain, surrounded with mountains on all sides.

11th day.—You arrive at Hamarwá, a large village, situated in the plain and inhabited by Fellanis, being on the frontier between the province of Boshi and that of Adamawa. The road lies through an inhabited hilly country, watered by numerous rivulets.

12th day.—About *aser* you arrive at a stream running eastward (?) called Baki-n-kogi, where you pass the night. There is no village here, the country being full of elephants, rhinoceroses, and other wild beasts.

13th day.—You stop at a considerable place named Ziná, situated on a hill, and watered by a rivulet. The whole country is cultivated.

14th day.—After having crossed a large mountain covered with trees, you sleep in the village called Dámeshi. The country is well cultivated. The inhabitants are Pagans.

15th day.—You reach the village named Gida-n-Darawa at the foot of the mountain. The cultivated lands are in the valley.

16th day.—You pass the night at Gida-n-Amána, a village built on the hill, while the cultivated grounds are in the valley.

17th day.—You reach the considerable place called Korállafe, situated on the river *Bínue*, which runs towards E. (Gabbes) ? and is larger than the Kawara. My informant assures me that it took him several hours to cross this stream. On it

there are plenty of boats. According to this man, as well as others whom I questioned on this most important point, the Binue falls into lake Tshad, running eastward far from Yóla.\*

18th day.—After a half-day's journey (as this travelling is in general), ascending and descending, you reach the village named Bautshi-n-dúsi.

19th day.—There is no village, but you rest during the night near a large water-tank called babá-n-fádama, in a large forest full of wild beasts.

20th day.—You reach Gandu, a village inhabited by the slaves of the mother of the Governor of Adamawa. Near the village is a rivulet, which runs towards the N.

21st day.—You reach the end of your journey, Yóla, the capital of Adamawa, a large town, situate in a plain and surrounded by a ditch; but all the houses, except that of the Governor, are built entirely of hashish. In this town, which is inhabited only by Fellanis and their slaves, there is a considerable market.

From Yóla it is said to be but seven days' journey to the capital of Lóggan.

The road to Adamawa is said to be difficult even for horses. The people themselves generally carry the luggage on their heads.

## II. Route from Kanó to Toto.—Slow travelling, viâ Kátab.

1st day. After passing in the morning the village and rivulet called Bakí'-n-Kogi, then another village named Góra, and afterwards Madobi, you enter Bebéji at sunset, first crossing a small rivulet. Bebéji is a considerable place, with a market much frequented, at which the Tuaryg sell a considerable portion of their salt.

2nd. After a short journey of about four hours, and having passed in the morning the village of Kamanda, where there is a rivulet, you reach the large place called Banda, situated at the foot of a rock. The town is surrounded by a mud wall, and the houses are built of mud in their lower part, while the pointed roof consists of shibki, or the reed of the ghussub.

3rd. About noon you reach an open village called Paké, situated by a stream of considerable depth, which you must pass in a boat or by swimming. There are some small hamlets on the road, but the country is covered with wood, a small part only being cultivated.

4th. At noon you reach the place called Kazintú, surrounded by a wall, the houses consisting entirely of hashish. There is no village on the road, but the country is open and cultivated.

5th. After a short journey of three or four hours you reach Zintu, a considerable place, surrounded by an earth wall, and situated on the N. bank of a large stream running eastward. There are two [ferry?] boats on the river, but no fish.

6th. About an hour after midday you reach Kawrú, a large town belonging to the province of Zegzeg, surrounded by an earth wall, and situated on the bank of a considerable river running eastward, on which there are boats. The whole day's journey through wood.

7th. At noon you reach the open village called Gidambakia, inhabited by Pagans, but subjected to the Fellanis. All forest.

8th. An hour after midday you reach Kátab, a large open place, which, on account of the quantity of honey produced here, is called Gari-n-zúmmua, "honey-town." It belongs likewise to the province of Zegzeg. The houses are constructed entirely of hashish. The country is very fertile, and the crops of ghussub, ghafili, cotton, and sesame are plentiful.

9th. At noon you reach the open village of Madowaki-n-mútua, belonging also to Zegzeg. There is here much cultivation, but the country begins to become mountainous.

10th. At noon you reach Jémdar Dáraro, a considerable place, surrounded with an earth wall, and belonging to Zegzeg. The inhabitants are partly Fellanis, and partly Pagans. There is a pool of standing water near the town. Mountains, forest, and cultivated lands on the road.

11th. At noon you reach Kogóm, a small village at the foot of a mountain, and inhabited entirely by slaves. On the W. side of the village there is a large navigable river running northwards. The whole journey through wood.

\* Subsequently found to be incorrect.—See pp. 197 and 198.—Ed.

12th. At noon you reach the large open village called Guári-n-kúrremi, situated in the midst of the forest, which covers the whole country through which you pass. There are no mountains.

13th. At noon you reach the large place called Toni, surrounded by an earth wall, and belonging to the province of Zegzeg. There are many hamlets on the road, the country being plain and well cultivated.

14th. About noon you reach Tonummádaki, situated in a valley covered with forest. To the S of the village there are two towns surrounded with mud walls, one being called Tonúgwambai.

15th. A little after midday you reach the small open village called Galbi-n-tánkua, situated on the S. bank of a small watercourse running northwards. The whole country is cultivated.

16th. At noon you reach a considerable place, surrounded by an earth wall, called Likóro, which also belongs to the province of Zegzeg. The walls of the houses consist of mud, and their pointed roofs of hashish. The country is laid out in fields, but there are no villages.

17th. An hour after midday you reach Káfi Awdezánga, a considerable place at the eastern foot of the mountains, and enclosed by an earth wall, the houses consisting of mud and hashish.

18th. After a short journey of four hours, you reach the village called Yan-kardé-zangó.

19th. Early in the forenoon you reach Guagua, a place surrounded by an earth wall. The country a little mountainous.

20th. In the morning reach Bókoko.

21st. About noon reach Basa, a large place in a mountainous country.

22nd. About noon reach Gorgóndara, a large walled town belonging to Zegzeg, situated in the plain. The inhabitants, who are not mixed with Fellanis, have a peculiar language.

23rd. At noon reach Wari, a large open place. The whole country is plain and cultivated.

24th. An hour after midday reach the village called Kargo. The country plain, covered with wood.

25th. Early in the forenoon reach Gwari-n-Kargo, a village situated at the side of a rivulet, which runs northward into the Kudúna. Here the extensive province of Zegzeg terminates. The country mostly cultivated, a little wood.

26th. At noon reach the open village called Basa, in a plain country. All cultivated.

27th. Reach at the same hour Ongol Limang, inhabited by the people of the Prince Limang. Between the rocks there is a streamlet.

28th. An hour after midday arrive at Toto, a large town protected towards the W. by a forest, and on the other sides by an earth wall. The houses are built, as the larger places usually are, of earth and hashish. Toto belongs to an independent prince named Limang, who is said to be very powerful, particularly on account of the number of musketeers in his service. He wages war successfully against the Fellanis, none of whom are allowed to enter his town.

In addition to this itinerary, I had begun to write a shorter one of only *seventeen days*, according to a man who was long in company with Abdallah (Clapperton) on his second journey, and is a son of his host, Haj Hat Salah; but this man, whose name is Ibrahima, left suddenly for Zinder while I was ill. He follows a straighter course without passing through Kátab, as that place does not lie on the direct route.

Leaving the direct route (as given above) at Kawrú. (6th Day)—

a. You reach one hour after midday Kefóro, a walled town, situated at the western foot of a large mountain. The whole road is covered with wood.

b. An hour after midday you reach Kúrremin Ussemán, a large straggling village in a hollow excavated by the water. In the morning you cross a small rivulet running westward.

c. At about the same hour you arrive at a small hamlet called Rimi. The whole road through wood.

d. In the forenoon reach a large straggling village called Sensánnin Jaba, which owes its origin to the Fellanis. To the W. of the village is a small river running westward.

e. About two hours after midday reach Koro, a large open place in a plain, but surrounded by mountains towards the N., E., and W.

f. In the forenoon arrive at Jammaa, a large open place of the Fellanis, situated in a large plain. Many farms. The whole day's journey lies through a valley-plain, with mountains on either side, those to the W. being called Kare.

g. About *aser* you reach the large place called Dárára.

h. In the forenoon arrive at Madaki-n-gai.

i. One hour and a half after midday arrive at Ishé.

k. A little before *aser* reach a small village called Goagállada.

l. At noon reach a small village called Kulgu.

m. About *aser* arrive at Abajé.

n. In the forenoon reach Gidan-n-mataué.

o. At noon arrive at Toto.

*Route from Toto to Egga on the River Kwara, according to the same informant, Ibrahíma.*

1st day. In the morning you arrive at Zángo-n-kara, a place belonging to Nyffi. The road lies through a valley, in part wooded.

2nd. One hour after midday reach Agaia, a large walled town belonging to the province of Zegzeg. The country well cultivated, with many scattered hamlets. Soon after leaving Zángo-n-kara you cross the river Gúrma running northward, on which there are two [ferry?] boats.

3rd. At *aser* reach a place named Kurremi, not so large as Agaia, but surrounded by two enclosures, one of wood and the other of earth. There is here a small river called Kúddúba running westward, but not navigable.

4th. One hour after midday arrive at Zángane Edrísu, a large open village situated on the bank of the Kwara. The country is open and well cultivated.

5th. In half a day you reach, in a boat, Egga, a town situated on an island in the Kwara, with a market, which is held on elevated ground in the middle of the town.

*Rivers tributary to the Kwara on its eastern side, in the provinces of Yauri and Nyffi, according to the same Ibrahíma.*

1. The Tshúso, descending from Kabbi.
2. The Gindi, which joins the former, having its sources near Zánfara.
3. The Wonkeshía, rising in the middle of Nyffi.
4. The Kadúna, coming from Zaria.
5. The Gurára, coming from Dsaba.
6. The Mátsirga, from Banikai.
7. The Rlíí, from Góndara.
8. The Benúé, which my informant is unable to trace beyond the town of Yakoba.\*

*Two Routes to Adamawa.*

*Kuka, April 12, 1851.*

My first informant, whose acquaintance is of great value to me, belongs to the Shurfa Ueled Bu-Seba, who live partly in the neighbourhood of Merákesh and partly in the Wadí Sakiet-el-hamra, south of Wadí Noon, together with the Ueled Delaim. My other informant belongs to that section which inhabits Sakiet-el-hamra, and his name is Ahmedu Bel Majúf. He has been five times to Adamawa.

*From Yakhoba through Adamawa to the Pagans; the first seven days S.E., then due S.*

1st day. Arrive, at about 1 P.M., at Káddera, a place of middle size, entirely built of ghussub-straw, and situated on a wadí, which, according to the assertion of my informant (disputed by me in vain), is the beginning of the Yaw,† the tributary of Lake Tshad. The country is plain and well cultivated.

\* See p. 195.—Ed.

† Yeo, in Bornuese, means River.—Ed.

2nd. About aser arrive at Maikéma, a village inhabited by Moslems. Pass many villages. Plenty of running water.

3rd. Between 1 and 2 P.M., Mátshijó, situated on a hill, and inhabited by Pagans. Besides durra and ghussub, the people have plenty of cotton, of which they make gebbega for the Sultan of Boshi; and yet they are not clothed, but go quite naked, having the entire face tattooed. The country is hilly.

4th. Between 2 and 3 P.M. reach Maimerámo, a small straggling village in a hilly country, inhabited by Pagans. The country is almost wholly covered with wood, much infested by elephants.

5th. In the forenoon reach Bogussa, situated on a deep narrow streamlet running to the river Bénue.

6th. In the forenoon reach Garí-n-serki-n-Kudda (not the native name, but so called by the people of Haussa), a village situated at the S.W. foot of the mountain, and inhabited by Moslems, while on the top of the mountain there dwell Pagans. To the N. of the road are mountains.

7th. In the forenoon, Jébjé, the frontier place of the province of Boshi, where salt is found of excellent quality and of a reddish colour. The country is not well cultivated.

8th. In the forenoon, Bumánder (called Báki-n-Kógi by the people of Haussa), situated on the Bénue, on which river there are many boats. Salt is found in great plenty. The inhabitants are Moslems, and are clothed. Hamárna, the residence of Sultan Mohammed, is at a short distance. According to my informant, this Sultan is under the direct command of the Sultan of Sokoto (which is the right pronunciation of Sakatú).

9th. Encamp near the Pagan Kóanas, on the bank of the river Bénue, which, according to my informant, is about 2000 yards broad. The people have a great many barks for crossing the river. The Kóanas are large of stature, surpassing all my informant ever saw.

10th. About 1 P.M. arrive at the dwellings of the Pagans, called Amána Bárka. The whole road through a plain bordered by mountains.

13th. In the morning arrive at the residence of Sultan Tsheshi, a Pagan prince, after having slept two nights in the open air. For, though the country, which is level, is inhabited, travellers avoid the Pagans. On the third day the plain is interrupted by high mountains, covered with trees, and is thickly inhabited.

15th. About 1 P.M. reach Sultan Yága, after having slept one night in the open air. The whole country is mountainous; and the inhabitants, who live on the tops of the mountains, are quite naked. They live on masr—the Egyptian durra.

18th. Arrive at Kúntsha, the residence of the governor Mohammed Gábdú, a Fellan, who is subject to the Sultan of Adamawa. The place is large, but the houses are entirely of hashish, with the exception of that of the governor, which is built of earth. The town is situated on a river, which in the dry season is fordable, but cannot be crossed in the rains without a boat. It is tributary to the Fára, which runs into the Bénue. The two preceding nights are passed in the Khalla, though the country is thickly inhabited by Pagans, who live on the tops of the mountains. Mohammed Gábdú is said to have not less than 10,000 slaves. From this place you turn a little to the W., continuing S.S.W.

19th. Arrive at Mailéggel, keeping along the river, which is to your left. The country is well cultivated by the slaves of the Sultan of Kúntsha, who inhabit the place. There are mountains on both sides of the road, but at some distance.

20th. A village of the slaves of Joróffágel, situated on a hill.

21st. Joróffágel, a place of middling size, built by a Fellan governor of that name, who resides here, being dependent on the Sultan at Yóla. On the march you have mountains, which, from what I can make out, seem not to form continuous ranges, but rather to be isolated. Before reaching Joróffágel you cross a river, which by Arab travellers generally, and by my informant, is called rás-el-má, and is represented as being the origin of the Bénue. It is a stone's throw in width, and is crossed on a sort of raft. My informant is well aware that the Bénue runs into the Kwara,\* and not into Lake Tshad; but unfortunately he does not remember the precise name which the river bears here.

\* See p. 195.—Ed.

22nd. A village of the Bâkr Yemyem, a section of the ill-famed Yemyem, who have obtained the name of Bâkr from a Fellani of that name who rules over them. These people (as was proved many years ago) really do eat human flesh; but where subjected to the Fellanis they are not now allowed to enjoy their favourite food. The place is situated on a considerable navigable river tributary to the Bénue.

23rd. Maibéli, a small place situated on the same river farther up, and inhabited by Fellanis and Pagans. The people, who possess plenty of cattle, live on milk and dukhen. About a day and a half still further up the river, to the S.S.E., is a large walled town called Tumbâti, the residence of Sultan Mohammed Sombo. The entire country is thickly inhabited. Maibéli is the frontier place of the territories of the Fellanis towards the S.S.W.; for the Pagans farther S. only pay the jézia, or ransom money, in order not to be molested by razzias.

24th. You enter the territory of the Tekâr Pagans, who, like the Yemyem, relish human flesh, placing the heads of those whom they have devoured (their enemies) as ornaments on the top of the palace or dwelling of their king. But their ordinary food is masr and dukhen. Of *ghussab* they have but little; cotton there is none. The Tekâr perforate their nostrils, some passing rings through the orifice, while others do not. They live in holes underground. The whole of their country, in which my informant marched ten days, is plain, there being only wadis and slight elevations. It is watered by small rivulets, but there is no large river; and it is shaded by the banana and gonda tree. The gonda is the most common tree in all Adamawa, but farther N. the banana is not known. During the last five or six days he saw the goro and the hanorua in great plenty. After ten days' march—S.S.W., S.W.—my informant came to

34th. The frontier of the Jétem Pagans, who go naked, and are armed with guns, but scarcely know how to use them. Their country is hilly, being at no great distance from the sea-coast. My informant was told that the roads leading from the palace of their Sultan are covered with sheep-skins for a distance of half a day's journey. They use cowries.

W. (?) of the Jétem live the Dindin, who dwell in trees, which are of so enormous a circumference that one tree is capable of holding ten huts. The weapons of the Dindin are said to consist of nothing but sticks and clubs, which they throw with great dexterity from their trees. The Dindin border on Bafû, where is found the tukurua. From the Jétem to Kéttofo is three days' journey.

#### *From Kuntsha to Yôla, direction E.*

1st day. About aser arrive at Lâru, inhabited by Fellani. The road winds along between high mountains, in which springs are very plentiful. The mountains are inhabited by Pagans, while the Fellani with their cattle occupy the valleys.

3rd. Arrive at a village situated at the foot of a hill, and at no great distance from Zéngi, a place inhabited by Fellanis. You sleep one night in the Khalla. The country is much infested by elephants.

4th. Reach a tributary of the river Fâro, called Baki-u-Kogi by the people of Hausa, and Bahr Hamila by the Arab merchants. The country, which is inhabited by the slaves of the Fellani, is much infested by elephants, as also by the large antelope called by the Arabs bagr-el-wahah.

5th. Reach a place called Hamidu, inhabited by Fellanis.

6th. Between 1 and 2 o'clock P.M. you arrive at Yôla, a large open place, and a sort of distant suburb of the large town of Gûren, in which the Sultan of Adamawa does not reside on account of the razzias made by the Pagans. Yôla is situated in an extensive plain, which is well cultivated. There is plenty of indigo; but salt is dear, one ass-load often fetching four slaves. Indeed, slaves are a cheap article of merchandise in Adamawa; and with a turkedie—worth about three-quarters of a dollar in Kanó—you may often buy a slave. Ivory is likewise very cheap; and, according to the state of the market, you may buy the largest elephant's-tooth for one or two turkedies. In Yôla cowries are not current, and the merchants purchase everything with turkedies and merjawtiddu—small yellow glass-beads from Venice. Yôla is situated on the Fâro, a considerable river, which receives all the small rivulets in which this country abounds, and is not passable except in boats.

I was surprised at learning so important a fact, as my previous informant, who (as I have told you) had been only once to Yóla, was not at all aware of it. But my new authority, besides being a very intelligent man, has made long and repeated sojourns in Adamawa.

On the same authority I add

*The direct Route from Hamdrrud to Yóla.*

2nd day. Zéngi. All the country inhabited.

3rd. Start from Zéngi in the evening, travelling the whole night in order to avoid the ferocious Pagans, who during the night remain quiet, but kill all who venture to traverse their country by daylight. In the morning arrive at Tabéru, or rather a place governed by Tabéra, and dependent on Yóla.

4th. Arrive at a place of middling size, inhabited by Fellanis and governed by Haj Fór. On the road you pass isolated mountains.

5th. Yóla. According to the same experienced traveller, it is a journey of only fifteen days from Yóla to Kúka; seven days from Yóla to the northern frontier-town of Adamawa, called Jemmára, the governor of which is Abd-Alláhi; from thence three days to Mora, the capital of Mandara, which is five long days' journey from Kúka. My friend was informed that the shortest road from the most distant town of Adamawa to Baghirmmi, through the Ajaséa, is only four (long) days. This road is now interrupted. The name of Adamawa is said to have been unknown before the time of the Fellanis, the country being named after Adama, a general of Oshman éan (bingel, in Fellani, the son of) Fodi the great conqueror. But it is very probable that the kingdom of Haúdama, cited by Ibn Khaldán, is Adamawa.

*Route from Yóla to Baia, according to El Mukhtár, an Arab of the tribe el Idésan, who live in Bágéna, a large country ten days N. of Sansanding.*

1st day. Górin (as this informant pronounced the name), the former capital of the Sultan, inhabited entirely by Mohammedans. Between Yóla and Górin, or Garen, there is no river, the Féro coming from the W., flowing round Górin on its E. side, and then turning northward towards Yóla. Exactly at the bend of the river, on its southern bank, is Búnda. Direction S.E.

2nd. Between 1 and 2 P.M., Lamárda, inhabited by Pagans. The road lies to the left of the Féro, which is crossed, at first setting out, at a ford in the dry season, and in a boat during the rainy season. The country plain—mountains in the distance. You then turn S.W. On the other side of the river is Tahámba, a large place situated at the foot of the mountains, and inhabited by Fellanis.

3rd. Encamp near the Búte Pagans, between 1 and 2 o'clock P.M. The country is mountainous on both sides of the road, the Féro being far off to the W. As throughout Adamawa, there is plenty of honey.

4th. A village of Fellanis, situated on a river running northward into the Féro, and called Maie Koléjo. Here resides a governor of the name of Ardo Mohammed. The whole country mountainous. The inhabitants pretend that there is gold here, but that they do not know how to obtain it. Arrive between 1 and 2 o'clock P.M.

5th. Arrive at aser among the Pagans, whose king is called Njaréndi, in the midst of isolated groups of mountains. The whole country under cultivation, the crops consisting of dukhen, durra, koltshi, and cotton.

6th. At mughreb reach a Fellani village, whose governor is Joro Kábdn. The country passed through is mountainous. The inhabitants are Pagans, but very well formed.

7th. Pass the night in the Khalla, among the Pagan slaves of the Fellani.

8th. Between 11 and noon, Gámderi, a walled place, of considerable size for this country, and said to be about the same size as Gummel, built entirely of reeds, with the exception of the house of the governor and the mosque, the former being built of earth, and the latter of earth and reeds. There is a daily market.

9th. Between 1 and 2 P.M. encamp among the slaves of the Fellan. The country is mountainous: riuulets in the valley.

10th. Other Pagans. Country covered with small villages.

11th. At aser encamp near a village of the Umbúm, a large well-made tribe of



Pagans, who tattoo their bodies, make cuttings in their chins, and sharpen their teeth. They live partly in the valley, and partly on the top of the mountains.

12th. Arrive at Baia, the capital of a district of the same name, governed by a Sultan of the name of Boshi, who is under the authority of the Sultan Bundam, Bundam himself being dependent on Loel, the Sultan of Adamawa. Baia is a place like Gánderi, situated in a plain between a wadí covered with trees and the foot of the mountains; but it has not any market. The inhabitants are almost entirely naked. They have asses and sheep, but no large cattle, which is the case also in Bangbay. They have plenty of fowls, which are eaten by the men, but the women do not touch them at all; a similar distinction between the food of the males and females being observed in all these countries. They likewise eat the flesh of elephants, of which there are very many in the country, and which are caught in pits. There are also numerous parrots. The country produces much dukhen, and the banana is the most common fruit. There is no cotton. The only weapons of the people are spears of wood, which they do not poison.

#### *Route from Yóla to Lóggun,*

Which I obtained from another pilgrim of the name of Abú Bakr ben Nám, a native of Kebbi, who on his way to Mekka passed through Adamawa, where he resided a whole year. He has also given me much other information.

(Rate of travelling very slow with a caravan consisting of oxen, donkeys, and a few horses, about five hours per day.)

1st day. Béti, a village inhabited by Fellanis, situated on a small stream of the same name, which runs from S. to N., and joins the Bénue. The country is plain.

2nd. Gúri, a large town situated on the western bank of the Fáro, a river larger than the Bénue itself, and running from S. to N. The country flat; mountains in the distance.

3rd. Banam, a place inhabited by Fellani. All the country flat. In the morning you cross the Fáro.

4th. Tsbéboa, a place inhabited by Wulemas of the Fellanis, of the tribe Ulérba. Country flat.

5th. Gárna, a place inhabited by the Pagans of the Bata, and situated on the Bénue, which is even here so large a river as to require to be crossed in boats. Towards the W. there are mountains.

6th. Dúkka, a place inhabited by Fellani, and situated on a small streamlet. The country well shaded by trees, amongst which there are plenty of rímá. Towards the W. mountains.

7th. Géwe, situated on the other (the eastern) side of the Bénue, which has to be crossed in boats at all seasons of the year, the Yemyem being the ferrymen on the river. A large mountain called Banawa, inhabited by the Pagans called Fali, rises close over the Bénue.

8th. Bázuma, a place governed by Sultan Jamhára. The country flat; wells and pools of water.

9th. Badési, inhabited by Fellanis; situated at the N. foot of a mountain. No streams.

10th. Bainga, a village in a district called Gídder, and governed by Sultan Omáro Imbílla. The country is mountainous, and the road here is not safe.

11th. Binder, a Fellani village. Country flat. No streams; pools of standing water.

12th. Lára, a Fellani village, with a mountain to the W.

13th. Míndif (so my Fellani informant calls what by others is called Méndefi), a Fellani village, situated at the S. foot of a very high mountain of the same name, which it takes three days to ascend. The Pagans of this district belong to the Summaia. Rocks black and red.

14th. Amawdin, a Fellani village in a mountainous country, but without running water.

15th. Jélguf, a Fellani village, situated at the foot of a small mountain, while the rest of the country is flat.

16th. Márrua, a considerable place, inhabited by Fellanis, and a market of importance, situated close to a mountain. The Sultan of this important place is Mallem Mohammed Dámra.

17th. Patawel, a scattered place, with a considerable market on Wednesday, and governed by Sultan Ingúdn.

18th. Bálasa, a Fellani village in a flat country.

19th. Malám, the frontier place of the Fellanis, towards the territory of Mús-gaw. The country flat.

20th. In the wilderness, thickly inhabited by elephants, buffaloes, rhinoceroses, &c.

21st. Wilderness.

22nd. Wája, a village belonging to the territory of Lóggun; but even here there are Fellanis, who come thus far with their cattle on account of the pasture-grounds. The country flat, only a few hills.

23rd. Jinna, a village in a flat, well-shaded country. To the S. of these last-mentioned places there is a most sterile desert, called (by the Fellanis) Fílí Obája, without a single tree.

24th. In the wilderness.

25th. The capital of the province Lóggun, a large town of the same name, situated on the Shári. As regards the form of the name, I must observe that the native name is Lóggéné, Lóggun being the form given to it by the Shafa Arabs. Without continuing this route farther eastward, I will only add that on the following day my informant, having crossed the Shári in the morning, slept at a village situated on the Aisu, which joins the Shári at Kússeri. Consequently, the Aisu is a branch of the Shári, and not the same river in its upper course.

#### *Route from Yóla to Ybo, W.S. W.,*

According to an educated native of Yakoba, of the name of Mállem Kadúri, who has travelled in Adamawa in almost every direction, and three years ago accompanied the important razzia made by the powerful Fellan governor of Tshámbe, whose name is Ambasambo. Rate of travelling about 20 English miles per day.

1st day. Maibati, a Fellan village, situated on the river Fáro. Arrive about noon. Direction almost S.

2nd. Lamardé, a village inhabited by Pagans, and situated on the Fáro, the course of which river the road follows. Mountains at a great distance. Fine country.

3rd. Tshámbe, a considerable place, inhabited by Fellanis, and governed by the above-mentioned Ambasambo. Tshámbe is finely situated, between the Fáro towards the E., and a large mass of mountain on the W., which is visible from a distance of seven days far beyond Yóla. This large mountain, which is called Alantíka, is thickly inhabited by Pagans governed by seven different princes, and its entire circuit is said to be four days' journey. The whole country is mountainous.

4th day. Gungúti, a considerable town of the Fellanis, in a flat country, mountains being visible towards the S. You reach the place between 1 and 2 P.M., having in the morning crossed the Fáro, which, during the rains, and for two months afterwards, is as broad as from the western to the eastern gate of Kuka, and is fordable here during seven months of the year.

5th. Sleep in the wilderness. The country is only a little hilly, and is full of wild animals. Principal fruit-trees, gígíña and gonda.

6th. Ambána, a Pagan tribe, on a river running from S.W. to N.E., and joining the Fáro. Towards S. and W. there are mountains. The whole country uncultivated.

7th. Mumberé, a tribe of Pagans living on the mountains. The country mountainous, the road itself leading over the mountains, but no watercourse.

8th. Rua-n-Dórina (the Hausa name, meaning "a lake inhabited by hippopotami"), a considerable lake among the mountains. A long day. Encamp at aser. No village.

9th. Sambó, a considerable place, inhabited by Fellanis. Country only a little hilly; water close under the surface.

10th. Adamajigera, a village governed by the Fellani Adama, and enclosed by mountains on every side. In the valley a fresh stream runs close to the village.

11th. Warwándu, a village inhabited by Pagans, and situated in a plain, through which the Fáro takes its course, being here from S. to N.

12th. Sleep in the forest. Country flat, thickly covered with trees. No inhabitants.

13th. Between 9 and 10 A.M. arrive at the considerable river called Jeren, running from W. to E. (?), and called by the Hausa people Kogí-n-Tibátí, from the large Fellani town of the name of Tibatí, situated on the S. shore of the river, which is to be crossed only in boats.

14th. Garí-n-Katshélla Búte, as the name implies, the residence of the chieftain of the Búte Pagans. The whole road through forests. No river.

15th. Garí-n-Katshélla Tekár, the residence of the chief of the Tekár. The whole country so thickly covered with forest, that you can scarcely get sight of the sun.

16th. Garí-n-Katshélla Yémyém, the ill-famed Pagan tribe. All forest.

17th. Garí-n-Móntsheran Búte, another chief of the Búte. Country plain.

18th. A Pagan settlement at the foot and on the top of a mountain called Ingua.

19th. Garí-n-serkf-n-Yémyém, the residence of the Sultan of these cannibals, situated in a valley thickly covered with trees.

20th. Garí-n-serkf-n-Fáudu, another tribe of Pagans, who have each their particular language. They are all armed with bows and arrows.

21st. Garí-n-serkf-n-Tekár, residence of the chief of the Tekár, who, according to my informant, give themselves four cuts close under the eye, a little towards the ear.

22nd. Garí-n-Katshélla-n-Búm, situated on another large river, not passable, except in boats, and called (by the Hausa people) Rua-n-Kado. It runs from E. to W.

23rd. Sleep on the northern shore of the same river, here called Baki-n-kogí-Jetém, after the Pagan inhabitants of this country called Jetém. It winds along among mountains.

24th. A village of the MÓ, a large tribe of Pagans, living on the top of the mountains situated on the same river. All this tribe are armed with guns. A long day's journey till aser.

25th. Another tribe, called Abó, on a rivulet winding through the mountains. All armed with guns. On your road you see the town of Umbli, with a large mountain towards the S.

26th. Dingding, another Pagan tribe, who eat clay, which they mix with butter.

27th. Yúrua, a Pagan tribe, armed with guns, and living on the mountains.

28th. Pó, another tribe, living principally on sugar-cane, which they boil and eat like honey. Mountainous.

29th. Ybo, dwelling in nine villages on the sea-shore, called by my informant Baki-n-rua. The Ybo have neither cattle, horses, nor asses, but plenty of large sheep, goats, swine, and fowls. The expedition which my informant accompanied spent two months in Ybo, plundering the whole country and carrying away a great many slaves. Since that time the Fellanis can in some respects truly say that their empire extends to the sea, of which Bello vainly boasted; for now every year the Ybos and their neighbours bring slaves, salt, and cowries, as a kind of tribute to the governor of Tshámba. The expedition afterwards took another direction; and from Garí-n-Katshélla Búm went to Bábo (Bafo?), in six long days' march, this country being three days to the N. of Ybo. But my informant cannot give any distinct account of this part of his journey; the only interesting fact which he is able to relate being that E. of Bábo there is a large town called Tshé, in a mountainous district. This memorable expedition was altogether absent two years.

#### *Route from Tshámba to Baia.*

1st. Lamardé (not the place of that name already mentioned), a journey of only four hours. The river Fáro is crossed before leaving the town of Tshámba.

2nd. Gabdómána, inhabited by Pagans. Country mountainous.

3rd. Sleep in the wood.

4th. Bére, a settlement of Pagans on the mountains. The country irrigated by small streams.

5th. Umbúm, a village of Pagans on the mountains.

6th. Umbúm bábel, the principal settlement of the Umbúm, situated at the W. foot of a mountain, the country being also bounded by mountains towards the W.

7th. Katir, another Pagan tribe in the mountains. Cross the Féro, which runs from E. to W., being always near the road. It is passable only in boats.

8th. Yángaré, a settlement of a section of the Yemyem of this name, in a mountainous country through which a stream runs towards the Féro.

9th. Yére, a settlement of Pagans in an extensive plain, without trees, but irrigated by water-courses.

10th. Baia, a place inhabited entirely by Pagans, and governed by a great many petty chiefs. The country is flat and all open towards the W., while E. of Baia there is a mountain.

*Route from Katágum to Bobéru, almost due S.*

1st day. Early in the morning, between 9 and 10 o'clock, you reach Sakkua, a large place surrounded by an earth-wall, on the E. bank of the Kogi Katágum, the water of which is used by the inhabitants. In the summer there is no stream, but merely pools of water. The houses of Sakkua are built partly of earth and partly of hashish. There is a market held here on Saturday. On the road you pass many small villages.

2nd. About 11 o'clock arrive at Kéfi, a large village surrounded by a wooden fence, and belonging to the province of Katágum. Many small villages on the road.

3rd. An hour after midday reach Hardawa, a large place surrounded by an earth-wall, still under Katágum. On the road you pass many villages. The soil consists of sand, and there are but few trees.

4th. Mésaw, a large place surrounded by an earth-wall, the houses being, as usual, built of mud, with pointed roofs of hashish, or the reed of ghussub. The palace of Yeríma alone is built entirely of earth. The inhabitants are all of them Fellanis. A considerable market is held here on Friday. All the soil sand.

5th. About noon Dáraso, a large walled place belonging to the province of Bawshi. In the morning you cross a stream in the midst of the forest. From Dáraso the road turns a little to the E. of S. From this place there is a road to Bawshi, which is given below.

6th. About two or half-past two o'clock P.M. reach Tawia, a large place with an earth-wall now in decay, where there are many Pagans. All thick forest.

7th. Early in the morning, about 9 o'clock, arrive at Bobéru, a large walled place, which is said to have received its name from the late Sultan, who died nine years ago. The present Sultan is Kuránga, a Fellani. His house is the only good building in the place, the other houses as usual.

*From Dáraso to Bawshi.*

1st day. About Aser reach Sóro, a small open place belonging to Bawshi, situated at the western foot of a rock. The road lies through a mountainous country, the first half being thickly wooded.

2nd. About 1 o'clock P.M. arrive at Kírí, a large open place under the rock, inhabited entirely by Pagans. The whole road is intersected by high mountains, with living [perennial?] springs. All Pagans.

3rd. About 11 o'clock A.M., Tyrrem, a large open place, surrounded by mountains towards the E. and S. On the road are small villages situated on the tops of the mountains, and inhabited by Pagans.

4th. Early in the morning, about 9 o'clock, arrive at Yákoba. All the road mountainous, with small villages on the tops of the mountains.

*From Bobéru to Yákoba.*

1st day. About 11 o'clock A.M. reach Berí-berí, a large open place situated in a broad sandy plain, the mountains being in the distance. The houses are not of earth, but are merely huts made of hashish. The place is inhabited by Fellanis and Berawnís. It belongs to the province of Mésaw. The inhabitants drink the waters of a river passing Berí-berí, and running towards Karé-karé.

2nd. About Aser reach Sémmeni, a large open place situated on a mountain. The inhabitants are all Pagans. The road mountainous, with villages on the tops of the mountains.

3rd. About half-past 1 o'clock P.M. reach Tyrrem.

4th. Yákoba.

*Route from Katágum to Shéra, S.S.W.*

1st day. About Aser reach Gubú, a large open place belonging to the province of Katágum. The country open, partly cultivated and inhabited, and partly covered with forest.

2nd. About 11 o'clock A.M. reach Uzm, a small open village belonging to the province of Katágum. The whole country is well cultivated, with many villages.

3rd. About noon arrive at Shéra, a considerable place, fortified by nature from its position among the rocks around it, which leave only a narrow approach from N.W. and S.; otherwise there is no wall. Most of the houses are as usual in the larger places, some only being of hashish. The house of the governor is built of earth. The market is of no importance.

*From Shéra to Bawshi. — W.; a little S.*

1st day. About half-past 1 o'clock P.M. arrive at Fagata, a place larger than Shéra, surrounded by a mud wall, being the frontier of the province of Kanó towards the S. The country flat.

2nd. About 11 o'clock A.M., Gánjua, a large open place belonging to Bawshi. All the houses are built of hashish, that of the governor alone being of earth. The country mountainous, with many springs and pools of water. Large numbers of palm trees.

2nd. About Aser arrive at Yákoba. Road through a mountainous country.

*From Kátab to Yákoba.*

1st day. About Aser reach Alhaji, a considerable village belonging to the province of Zaria, and situated at the W. foot of a mountain. All the road through forest.

2nd. About noon arrive at Sabón-birni, a small village built of hashish. The road is partly covered with forest and partly cultivated; but there are no villages, the people during the rainy season coming from a great distance to cultivate the country.

3rd. About noon reach Rírne, a considerable place, surrounded by an earth-wall, situated where the roads from Kanó and Kátab meet. A market is held here every Tuesday.

4th. About 1 o'clock P.M. reach Ambutú, a village situated at the foot of a mountain, on the top of which there is another place of the same name. The inhabitants, who are very ferocious, pass a bone through their mouth. They do not pay tribute to the Fellanis, and constantly interrupt the communication, as is just now the case. There is a rivulet near the first village which runs into the Gurára, one of the tributary streams of the Kwara. The whole road through forest.

5th. About 1 o'clock P.M. reach Warji, a village situated at the foot of a large mountain winding round far to the W., on the top of which there are other villages of the same name, whose inhabitants wage war against the Fellanis, having [lately?] killed the eldest son of the governor of Kanó, to whom the inhabitants in the valley pay tribute. There is a particular kind of cattle here called Mutdrn, smaller than the ox, with shorter legs, and without the hump of fit on its back.

6th. About Aser reach Malánlawel, a considerable place with an earth-wall, situated in the plain at the S.E. foot of the large mountain or mountain-range already mentioned. The whole country is laid out in cultivated fields.

7th. After Aser arrive at Sáranda. The road partly wood and partly cultivated.

8th. At noon Yákoba.

*Route from Kanó to Kúka, by the way of Khadéja, or the Middle road, there being three roads, viz., by Katágum or the Southern, by Khadéja, and by Gúmmel.*

1st day. About 1 P.M. reach Gódia, a walled place, where the governor of Kanó has a house.

2nd. Half-past 1 o'clock P.M. reach a place called Gais, after having passed at about 1 A.M. a large Wadí, which has water only in the rainy season.

3rd. About Aser arrive at Dútshi, after having in the morning crossed a stream called Dedúrru, and about an hour before midday an almost deserted place called Katá-katá.

4th. About Aser reach Zogó, a large open place, after having in the morning crossed the Kadwana, which runs towards Katágum. Many small villages on the road.

5th. Before Aser reach Khadéja, a large place, the residence of the governor, surrounded by a wall of great extent, but not inclosing so large an open area as Katshna or Kanó. The entire space however within the walls is inhabited. The houses consist of collections of circular huts and sheds of hashísh surrounded by a mud wall. This is the last place on the road from Kanó where maríná or dyeing with indigo is met with; but there is no other business carried on here, as the inhabitants employ themselves in roving expeditions or razzias, for which the position of the place is favourable. To the S. of the town is a Wadí running down towards Bede, with pools of standing water during the dry season, the banks on either side being laid out in corn fields.

6th. About 11 o'clock reach Garángabbes, a walled town smaller than Khadéja, on the other side of which commences the territory of the Sheikh. The whole country through which you pass is divided into numerous small villages.

7th. At Aser arrive at Alhamégo, a deserted place. The whole country covered with forest.

8th. About 1 o'clock P.M. reach Kálemrí, a large place situated in a sandy plain and surrounded by a wall built of sand, the houses being of the usual materials. As far as Bendí, a place surrounded by a wooden fence and belonging to the Galadíma(?) of Bornú, the whole country is covered with wood. At this place the province of Manga commences.

9th. Reach Donári about Aser, a large place surrounded by an earth wall; after having passed a small Wadí called Wáni about 1 o'clock P.M. There is no village on the road, and all is covered with wood.

10th. Arrive about half-past 1 P.M. at Anganawen, a place of middling size, with an earth wall. All the country covered with wood.

11th. Reach an open place or valley, about half-past 11 A.M. The houses consist of earth and hashísh. The entire road through forest.

12th. About noon arrive at Kusselúá, an open place. The whole country covered with wood.

13th. About 4 o'clock P.M. an open place called Kashímma, situated on the side of a Wadí, which comes down from Katágum, and passing by Míkibá joins the Yaw. In this Wadí there are pools of standing water during the dry season, and its banks are laid out in corn fields. The whole country wilderness.

14th. About 1 P.M. Míkibá, an open place, situated on the same Wadí. No cultivation on the road.

15th. About 1 o'clock P.M. reach a well called Kaskawa, where you encamp. No village, but shepherds.

16th. About the same time arrive at an open place called Kinshándi. This day you pass some small villages on the road.

17th. Reach a considerable open place called Búa, a domain of the Sheikh of Bornú, whose slaves cultivate the fields. On the road are numerous villages, and the whole country in cultivation.

18th. Between 11 and 12 o'clock arrive at a small village called Kangárruá. Numerous villages.

19th. About Aser reach Kalíluá, after having passed many villages on your road. You here see the trees of Kúka.

20th. In about two hours arrive at Kúka.

#### *Northern Route from Kanó to Khadéja.*

1st day. A little after midday, Gezawa, a walled place with huts of hashísh. All the country cultivated.

2nd. About Aser, Zákeré, a large walled place, the houses of which are built of earth and hashísh. Many villages on the road.

3rd. A little before sunset reach Kílli, a considerable walled place: the houses as well as the wall being built of earth. Only a few villages on your road.

4th. About Aser arrive at Merké, a large walled town built entirely of earth. You pass many villages, all belonging to the province of Khadéja.

5th. About an hour before noon reach Askádu, a large open village, with huts of hashish.

6th. Early in the morning, about 9 o'clock, reach Khadéja, after having passed many villages.

*Route from Kanó to Kúka, by the way of Gúmmel.*

1st day. A little after midday Gezawa.

2nd. About 10 o'clock A.M., Gabesawa, an open place with a considerable market, which is held every other day, as is also the case with Gezawa, so that there is every day a market at one of these two places.

3rd. In about three hours reach Kúka-merúá.

4th. About Aser arrive at Gírki, a large walled place; the houses consisting of earth and hashish. In the morning you pass a small open place called Amágná, and about an hour before midday Dóko, a village situated in the midst of the wood.

5th. About 2 o'clock P.M. reach Gúmmel, the first place belonging to the Sheikh, surrounded by a wall of earth, and a wooden fence, as likewise by two ditches, one inside and the other outside. Its Sunday (láhedí) market is important, though there are no manufactures in the town, which is the residence of the former governor, Daw Tanóma. About 9 o'clock in the morning you pass an open village called Delládi, and further on a walled place called Birmenawa.

*Gúmmel, March 13, 1851.*—Here in this place, where I arrived yesterday, accompanied by a very amiable and well educated Sherif from Fas, I continue this itinerary, which, as far as I have seen, is very correct, with the exception that there is a market here on Friday, Saturday, and Sunday; the most important being that on Saturday.

6th. About half-past 1 P.M. reach an open village called Mai Magariá. The whole country is cultivated, and there are a few small villages on the road. The fields contain only a few large trees.

7th. Between 2 and 3 P.M. arrive at Taganána, a large place surrounded by a wooden fence. On the road you pass a deserted place called Fernaski, which has been plundered by the people of Khadéja.

8th. About 1 P.M. reach a small walled place called Ingleri, belonging to the governor of Máshna. The country covered with large trees.

9th. Máshna, a town of the same size as Tasawa, surrounded by a wooden fence, situated at the S. base of a considerable hill, while also towards the S. there is another hill of less size. The houses consist of earth and hashish. The market is held on Sunday. The present governor is Barma Kakámí.

10th. About 1 P.M. reach a small village called Bertari, after having in the morning passed Gogí, an open place situated at the foot of a mountain, and governed by the brother of the governor of Máshna.

11th. About 11 A.M. arrive at Súlleri, a large open place belonging to the governor of Minyo, with a market on Friday. In the morning you pass Ségrari, a small village.

12th. In the morning reach a considerable place called Boné, situated at the S. base of a large hill, with the house of a governor. The country woody.

13th. About Aser arrive at Túngulé, a village with plenty of date trees, situated at the S.W. foot of a mountain or hill. The road lies through a country covered with wood, but about an hour before midday you pass a village called Gasem, situated on a hill.

14th. About 9 A.M. reach Minyo, a large open place situated in the midst of the sand, and consisting entirely of hashish, with the exception of the house of the governor, Ibrahim Kóso, who has to deliver the tribute to Abder Rahman, the brother of the Sheikh of Bornú. A considerable market is held here on Friday.

15th. About 11 A.M. reach Kadaláffua, a large open place belonging to Manga, situated in a Wadi containing numerous trees, the country, which is all sand,

being in general open. Much trona (natron) is found here, and constitutes a very important branch of trade with Nyffi, by the way of Kanó.

16th. About the same time reach Beri Bérshi, a now deserted village, situated on a Wadí where there is good salt. The entire country is one open sandy plain, with isolated hamlets.

17th. About 1 P.M. arrive at Katsáfuliram, a small deserted village. All the country consists of sand without trees.

18th. About 1 P.M. reach Dembáram, a large place belonging to the district of Astéka, situated in the sand, and built entirely of the reed of the ghussub.

19th. About Aser reach Berberuá, a large walled place. The whole country is nothing but sand. No wells.

20th. Early in the morning, between 9 and 10 o'clock, reach Debággo, a small village situated on a branch of the river Yaw, which is dry in summer. In addition to ghussub and onions a little corn is cultivated here. There is no more sand, and the soil is fertile, the country being covered with trees.

21st. Encamp at what hour you please, in a district called Kóéam, consisting of many small villages.

22nd. Encamp in the same district with the tribe named Mebber.

23rd. About 1 P.M. reach Buá, the country densely peopled.

24th. About 11 A.M. encamp in the district called Kagárruá.

25th. At Aser, Kaliluá.

26th. Early in the morning arrive at Kúka.

If you desire to take a shorter road, and not go by Mínyo, you proceed direct from Máshna, and between 11 and 12 o'clock reach Bendi on the Khadéja road—this road by Gúmmel, Máshna, Bendi, &c., being at present the general caravan road between Kanó and Bornú, as it is by far the safest.

### *Second Letter from Dr. Barth to Mr. Petermann.*

#### *Route from Kanó to Toto, viá Zaria.*

1st day. The direction S.W. as far as Zaria, then S.

2nd. Between 10 and 11 A.M. reach a place called Mádobí, with a market.

3rd. Between 9 and 10 A.M. reach the town of Bebéji.

4th. About 1 P.M. arrive at Rimi-n-Kawra, a number of villages, with a rivalet, running eastward.

5th. About 9 A.M. reach Baki-n-Káminda, a group of scattered villages.

6th. About 11 A.M. reach a walled town, called Dansóshia, rich in date trees. Here is the frontier between the province of Kanó and that of Zaria, marked by a large wadí, dry in summer.

7th. A little after noon reach a small river running eastward, but afterwards turning to the S., and uniting its waters with those of the Kadúna, which receives all the water of this part of the country. The river is called Kubútutú, and there is a village on its bank, called Anshó.

8th. About 11 A.M., after a journey through a woody country, reach Rúma, a large place, but thinly inhabited, and with the walls in a state of decay.

9th. About the same time you reach a walled place, called Likóro, where there is a market every other day. All the country is thickly wooded, and not cultivated.

10th. Between 9 and 10 in the morning, after having crossed a river, which sometimes in the rainy season it is difficult to pass, you arrive at Zaria.\*

11th. Between 11 and 12 A.M. arrive at a village called Ungua Arendé. Small water-pools on the road.

12th. About 11 A.M. reach Kaséllu, a walled place, with the wall in a state of decay, and with a market held on every other day.

13th. About the same time at Gímba, a large walled place, but thinly inhabited.

14th. Reach Mátarí, a large place. Between Gímba and Mátarí, nearer to the latter place, there is a wadí, which during the rainy season can only be crossed in boats.

\* Though Clapperton proceeded on this road as far as Zaria, there are many new particulars in this itinerary.



- 15th. Kabí, a considerable walled market-place.
- 16th. Reach a small village, called Kásabó, situated on a mountain range running eastward. The whole country is mountainous, and a little before you reach Kásabó there is a high mountain with another village on its top.
- 17th. Encamp in the forest called Dawa serki-n-Fawa, where there is a wadí, dry during the hot season.
- 18th. A small village of the district Kadára, plundered by the Fellanis.
- 19th. During the dry season you reach a place called Tére, while in the rainy season you encamp on the shore of the Gurára, one of the branches of the Kadúna, which cannot be crossed but in boats. The country mountainous.
- 20th. Reach a small village called Kámané. Country mountainous.
- 21st. A small place, called Káterí, situated on a wooded wadí, with water at all seasons of the year.
- 22nd. A scattered village, called Golamínda, inhabited entirely by Fellanis. The country level, with mountains at a distance.
- 23rd. Reach Kogáro, a considerable market-place. Country mountainous, irrigated by many streamlets.
- 24th. Fajári, a small place with a wall in decay. Country plain, with plenty of water.
- 25th. Bagáji, a considerable walled market-place.
- 26th. Kéfi Abdesénga, a large place, with a market every day. There is a high mountain to the W. The country in general is flat. Plenty of streamlets.
- 27th. Gongóndara, a large place, with a wall in decay. The mountains at some distance. Much water.
- 28th. Guáguá, a place of middle size. A mountain to the E.
- 29th. Támma, a large walled place in a plain, with much water.
- 30th. Dógeri, a place of middle size, wall in decay, the frontier of the extensive province of Zaria and of the independent kingdom of Tanda.
- 31st. Ogobé, a large, walled market-place, belonging to Toto. No mountains, but much water.
- 32nd. Gano, a considerable open place. Country flat, plenty of trees, particularly of those called maja (the gum-tree).
- 33rd. Arrive at Toto. This place, according to my informant, is of about the same size as Kanó; but is more thickly inhabited, and is divided into two distinct quarters, the Western and the Eastern, the former being inhabited by the natives or the Katawa, who have a distinct language, and are pagans, while the eastern quarter is the dwelling-place of the Moslems, viz., people from Katshna, Kanó, and Bornú, who have a sultan for themselves, El Imán. According to my informant, El Imán is not the Sultan or Governor of the whole town, the town and province of Toto being under the direct government of the Sultan of Tanda, whose name is Shémmege. To the W. of the town there is a rivulet called Ráfi-n-Konáma, at the foot of a mountain.
- Three days to the S. of Toto there is a country called Tágara, whose inhabitants, called Kátun-kárfi\* by the Haussa people, bring European merchandises and cowries to the market of Toto. My informant, like every one else in the interior, has no idea of the distance to the ocean, nor does he know anything about the Tshadda, which river is certainly identical with the Benue, and must be near to Toto.
- From Toto to Yakóba there are said to be 7 days.

#### *Route from Gínga (Gonja?) to Sákátú,*

According to two different informants, one of whom is the same person who gave me the route to Toto; the other is a man who has travelled more than twenty years on the Bilád el Sudan or Desert, and is a brother of a servant of Abd Allah Claperton.

Direction N.E. Road stony. The rate of travelling is slow, and on asses, encamping generally between 11 and 12 o'clock. About 6 hours per day.

1st day. Masáka, a small village; merchandise, kola nuts.

2nd. Village called Turú.

3rd. A place rather larger, called Kadeña, belonging to the district of Yensala.

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\* Katu-n-kárfi, iron district.—Ed.

- 4th. After having crossed a river running towards the E., arrive at Kafía.  
 5th. Yendi, a well-known place of importance (Dahomey?).  
 6th. Sakaigo, a small village.  
 7th. Maizabbi, a small village.  
 8th. The large town of Sásanimángo.  
 9th. A small village, called Gángari-n-gulbí, situated on a water of great extent (R. Galbí?).  
 10th. A deserted village, called by the caravan travellers Garí-n-mutúm daca.  
 11th. A small village, called Maitukánc.  
 12th. Belgú, a considerable place with plenty of gígíña, a kind of palm-tree peculiar to Bilád el Sudan.  
 13th. Village called Féllalé, built partly upon the rock.  
 19th. Fámua, a large place, and the residence of an independent sultan, who wages continual war with Borgu. The language is not Fellani, but a retana or gibberish. From this place the territory of the Fellanis begins.  
 20th. Kóre, a small place.  
 21st. A place called by caravan travellers (Jarí-n-maifari-n-doki.  
 22nd. A place called Majóri, situated at the northern basis of a mountain. Hereabouts is a river called Ráfa-n-góra, which is sometimes crossed by swimming on skins.  
 23rd. A place called Suduméli sabó.  
 24th. Encamp near to Suduméli sófo (old), a large but deserted place.  
 25th. A considerable town, called Dágu, situated near to a river called Mákura.  
 26th. A village whose name my informants do not recollect.  
 27th. A place of middle size, called Kurkujángu.  
 29th. Baki-n-Kúmba, a large place situated on the W. shore of the Kawára. Here are a great many boats.  
 30th. Cross the river towards the E., and encamp near Baki-n-rúa, a small place on the opposite shore.  
 31st. Foga, a place of middle size, but thickly inhabited on account of the excellent red salt which is found here, and constitutes an important article of trade.  
 32nd. A small village called Béngo.  
 33rd. Yéllu, a large place with a wall of earth; the first walled town on this road.  
 34th. A village called Kúka.  
 35th. Another walled town, called Gúlma.  
 36th. Encamp in the district called Gáwasu, from which the walls of Birni-n-Kébbi are visible in the distance to the right.  
 37th. Encamp in the same rich and thickly inhabited district, full of cattle and rice.  
 38th. Still the same rich district.  
 39th. You arrive at Sákatú.

*Itinerary from Karnak Baghrimmi to Bang-bay.*

- 1st day. Masséna, a large place of Baghrimmi.  
 2nd. Arrive at the river Ba-ír, which runs eastwards, and is called so after a town of the name of Ir, situated on the other side of the river. (Ba means water, river.)  
 3rd. Batshikám, a small town belonging to Baghrimmi.  
 4th. Early in the morning reach Garám, which you leave in the afternoon about 2 P.M., and sleep in the forest.  
 5th. Láffana, situated on a watercourse running E.  
 6th. Embarked in a boat, followed the river, and slept on its bank. Does not remember the name of the river.  
 7th. Reached Búso in the morning, a considerable place, with a powerful sultan.  
 8th. Mirti, an island in the Sháry, with a great many boats. The river is full of crocodiles, and the inhabitants do not venture to go near, but fetch water from a well dug expressly for this purpose at some distance.  
 9th. Halánga, a place under the same government as Búso.  
 10th. A large town, called Tabé, inhabited almost entirely by Mohametans.  
 11th. Gadáng, a village whose inhabitants are pagans.  
 12th. Kiár, a small village.

13th. A considerable place, belonging to the powerful sultan Ali Fenjár. All these places are entirely built of hashish, or rather ghussub straw. The country is rich in horses, and is one level.

14th. The residence of Sultan Bang-Dam. The country is flat, and is covered with small villages, shaded by fine trees. The soil sandy. All the inhabitants are naked, excepting the sultan, who wears a robe. Their principal food is horseflesh.

15th. A large place in the province, called Isemrai, the residence of the sultan, Bang Wónja. The soil is here clayey.

16th. Another town of Isemrai, the residence of the sultan Búrso. Soil continues clayey. The wells are from two to three fathoms deep. Ghafúli is the principal produce and food. Some large trees.

17th. The sultan Eatsáng Gongawe, whose country is thickly inhabited. There are a great many valleys, dry except in the rainy season, when the country is impassable.

18th. After a long day's journey arrive at Gábberi, a large place. All these petty kingdoms make war on each other, and the inhabitants kidnap each other. Nearly all these people, from the beginning of Iserurai, eat their dogs, though they have plenty of cattle as well as of horses. Their idol is a tree of the kind of júnés, as the Arabs call it, round which they kill dogs and sheep, while they make a dreadful music by beating on dried skins. They are not armed with bow or spear, but only with the sling, which they call jógaji in their own language.

19th. Arrive at Korín kína, a large place, residence of the sultan Koina. It is strongly fortified for this country, being first surrounded by an earth wall, then at a greater distance by a fence of wood, outside of which there is a ditch skirted by trees. The town is surrounded by a great many villages. The inhabitants, pagans of course, wear nothing but a girdle of leather. The principal produce of the country consists in beans.

20th. Enter another territory, called Sará, belonging to the Sultan Gósega, who resides in a large open place. Here, besides beans, plenty of ghussub and ghafúli is cultivated; and a tree grows here, which is of great use to the inhabitants, who not only eat its fruit, which resembles dates, but use its pith instead of butter and oil: it is called táber, and has a large top, but small leaves.

21st. Reach Sarángakúmra, another place belonging to Gósega, who is quite independent. The inhabitants drink the water of a standing pool.

22nd. After a good day's journey arrive at Sará bedai, residence of the Sultan Sariá, who has plenty of cavalry at his command.

23rd. Yaídáng, inhabited by people of the great tribe of the Búa.

24th. Arrive at a place called Gamkúl. The country has now changed, and has acquired another aspect; for instead of clay, the soil consists of sand; and instead of a monotonous plain, where water is only obtained from wells, the country is mountainous, the mountains and hills being covered with trees, and rivulets rushing down from them. It is thickly inhabited by elephants, giraffes, lions, and swine; this latter animal constituting the principal food of the inhabitants.

25th. After having crossed the mountain range, arrive at a place called Dafí Mádobó, situated at the southern base of the mountains, and the residence of the Sultan Garé. Cotton, dúrra, and ghafúli are cultivated.

26th. Dafí Bébe, the residence of Sultan Gárgodá. In this part of the country there are no watercourses but in the rainy season; produces cotton and dúrra.

27th. Komé, in a mountainous country. While the fields are on the slopes and tops of the hills and mountains, the inhabitants live in the valleys, not retiring to the mountains but in case of war.

28th. Kómaré, with a few Mahometans. No dress but a girt round the loins. A rock is their idol. Country mountainous.

29th. Andí, after a whole day's journey. The people, called Sójiga, surpass their neighbours in civilization; for they dress not only themselves, but even their horses. The country all mountainous.

30th. Burdá, situated on a lake of great extent, considerable depth, and full of fish; enclosed by mountains all round. It is called Garmánga.

31st. Támki, in a mountainous country, producing dúrra, besides which the inhabitants live principally on lizards, which they cook. They are all Pagans, of a dark black colour, armed with spear and arrow. While the men wear clothes, at least a shirt, the women go naked.

32nd. Góberá, whose inhabitants go naked. The country mountainous, covered with many trees.

33rd. My referents reached Bang-bay, situated on the south bank of a large river running eastward, and called here Babay, that is to say, the river of Bay. There are a great many boats on the river, and it is full of fish. Bang-bay is the residence of the Sultan Sará Gulí. The people live like animals, and are only armed with slings. My referent, or rather one of the two brothers, viz., Agít Búrku, though he made a stay of three years at Bang-bay, could not give me any information as to the countries farther to the S. But to satisfy my curiosity he brought to me a son of his Majesty the King of Bang-bay, by name Tikórkum Kásemítú, who condescended for a few cowries to sing and dance before me after the fashion of his country: I am sorry to say, however, that the prince's intellect was not clear enough to give me much information. Besides a few words of his own language, I could only make out the names of four countries or districts to the S. of Bang-bay, with the names of their respective petty sultans. These are Tshik-fkaná, with the Sultan Nie Dau tshin Bay kóbbo; Urdaujé, with Bay Kóbelé; Négeré, with Ingigge du Kúddu; and Jiggikábera, with Sultan Bang Umkaiji; this last is a large place. All these districts and towns (for the name represents both) are on or not far from a very large lake, called Inji koró. On anxiously inquiring after this lake I was told that there were seven such waters almost parallel to each other farther to the S., the names of three of which are Inji Kemáda, Inji man-máde, and Inji mantó.

*A few Words of the Bang-bay Language.*

English.	Bang-bay.	English.	Bang-bay.
sun	kár	horse	ngélla
moon	nai	elephant	dakír
stars	koöyé	sheep	biñan jélleba
heaven	tár	pig	berí
rain	ínjiketár	dog	bissí
God (idol)	Omaji	lion	tobai
rainy season	bár	milk	imbá
dry	jéne	durra	wa
wind	múla múla baig	spear	ninga
fire	purúállaba	sling	miá
water	inji, man	dress	kobú
man	dínga	guest, friend	baje
people	bémea	enemy	jejángejé
father	bábunja	good	májibai
mother	komé	bad	koré
woman	denétéma?	warm	wulbaái
head	daigélle	cold	ótoko
eye	kamtó	to-day	binnétéma
ear	dudú	to-morrow	baralínga
mouth	taríbeglem	come, imp.	ideromto
heart	mumtúm	go, imp.	aw

*Route from Timbuktú to Sakatú, by Mohammed el Anaiá, who performed the journey in quick marches.*

In eight days reached Humberi, a large town situated on a mountain, with a considerable market every day. According to Mohammed el Anaiá, Humberi belongs to the Fellani residing in Timbuktú, and the language is likewise Fellani; but, according to another traveller, the language is identical with that of Timbuktú.

15. In 7 days, Harbánda, at the foot of a mountain: it belongs to the Fellani, but not to those of Sakatú. It is situated on a tributary of the Kawara river.

16. In 1 day, Elbetáko, a large place, with considerable market, under Khalíu, who resides in Gandu.

20. In 4 days, Tankála, a large place, and residence of the sultan Abu-l-Hassan.

24. In 4 days, Sei, a large place on the banks of the Kawara, where the same language is spoken as in Timbuktú.

31½. In 7½ days, Gándú, the residence of Al Khalífi's, larger than Sakatú.

34. In 2½ days, Sakatú.

*Route from El Dra. to Timbuktú, according to Dara el Sacktanéh, who performed this journey nine times: quick marches—halts not taken into account.*

1 day's journey to the well of El Mengúb; arrived there about 1 o'clock P.M.

5½. On the fifth day to Tháb-il-belt, a village with Kasr, and a plantation of palms, fig, almond, and fruit trees, with springs. Residence of the Ueled Sidi Háj el' Arbi.

11. 6 days, the well Dëssia, with water convenient and good.

15½. 4½ days, the well Shenáshan; sandy desert, heights in the distance.

20. 4½ days, the well Tágmínnant, with good water.

24. 4 days, Taódeni, said to be a considerable place, with houses of earth. The chief of the place is the Kaid Sin. Salt, of excellent quality, is found 4 feet below the surface of the ground, and is exported in pieces about 4 feet long, 1½ feet broad, and upwards of 1 foot thick.

27½. 3½ days to the well, Agilt el Khaná-shish.

29. 1½ days to the deep well, Unáu. Good water.

34. 4½ days, Arauan, a considerable place, with market: the inhabitants Arabs.

From Arauan to Timbuktú 5 more days.

*A few Words of the Timbuktú Language.\**

English..	Timbuktú..	English.	Timbuktú.
sun	waina	wood	géngi
moon	héndu	tree	tugúrri
heaven	bíni	timber	tugúrrimi
fire	nóni	gold	(dohob)
rain	bana	silver	ansarfo
lightning	húrri	iron	guro
water	haeri	copper	guro kire
year	njúm	bronze	guro kára
day	sári	bread	tákulá
month	héndu	meat	(hám)
to-day	hánno	milk	{ wa gáni
to-morrow	soba	cheese	{ wa búnu
yesterday	bikigi	salt	túndi
the day after to- morrow	sobaschi	pepper	kíri
man	hár	ghussub	déndi
woman	wai	ghafuli	haini
son	isakaina	rice	sába
daughter	waikaina	beans	mu
brother	nehar mai	basin	dúnguri
sister	newai mi	kettle	tsú
father	nibába	spoon	kusu
mother	nia	place, village	súrto
horse	béri	town	koira
camel	yu	house	koira bér
ass	fárka	door	ho
mule	alimbána	room	gambú
sheep	ági	bed	téska
goat	hénki	mat	dári
dog	héntschi	boot	tángara
lion	koro	oar	hí
jackal	héntschi fútú	blacksmith	kai
hare	ingiri	shepherd	malle
river	isa		figigúrko

\* Which differ, according to Dr. Latham, from the Emghedesie only in representing a different dialect.—Ed.

*Vocabulary of Badduma, spoken by the Inhabitants of the Islands in Lake Chad.\**

English.	Badduma.	English.	Badduma.
sun	tji	elbow	injirné
moon	kiá	hand	
star	shelágo	finger	
dry season	kárbai	nail	
rainy season	hómar	leg	tshú
water	ámái	foot	kairéshá
rain	imán	ankle bone	ilítshá
fire	aw	toe	lullé
cloud	birás	skin	tshítregu
fog	delámdelám	word, language	máasa
wind	ashí	intellect	ánkel (Born.)
dawn	kuádu	camel	lógomí
morning	hawngaiú	ox	sa
day		cow	
night		ox of bardea	túmma
man	saúai	horse	bokór
people	raigó	sheep	
woman	ingerim	goat	
father	ba	bird	
mother	yai	fish	
son	igenai	sea	kúlú
daughter	diggeram	river	tshállego
girl	ku?	mountain	
brother		island	
sister	the Bornúese	milk	iai
grandson		sour milk	denépa
son-in-law	amít	millet	fio
daughter-in-law	amiró	corn	miaw
grandfather	kégaí	meat	
grandmother	birá	house	
head	kú	hut	
eye	yil	boat	pám
ear	summón	oar	tuán
mouth	gai	spear	lai
lip, upper	gai ngedai	arrow	karnígi
lip, lower	gai nge fari	good	ngilla (Born.?)
tooth	sannai	bad	abi
tongue	télam (Born.)	warm	jerau
front	bahán	cold	sómar
hair	njiggo	to-day	tióaniar
tattooing	billá	yesterday	tshoro
chin	kómmoda	to-morrow	báli (Born.?)
neck	wui	where	júmeni
throat	gurgutó	here	ungojó
nose	tshanai	yes	jai
face	bahán	no	aio
breast	engánji	I see	wammenú
blood	kí	I hear	wuhúmmai
intestines	andé	I eat	wuhúta
heart	gaigo	I drink	wushín
bones	hai	I go	wuál
marrow	tshébió	go, imp.	bél
shoulder	úngurú	they go	béllam
back	kaia	I come	wuaw
upper arm	bibikó	come	aw
under arm	ushimé		

\* Dr. Latham has compared this vocabulary with others, and finds that of all the known languages of Africa the Badduma resembles most closely the Affadeh. — Ed.

1. *Route from Sakatú to Timbukú, according to the learned Sherif Ahmedu.*  
(From Sókoto, direction W.)

1st day. Birni Tózo, situated on the river of Sókoto, which here passes between two mountains, one of which is situated to the N. and the other to the S. Tózo is a place consisting of four or five separate villages, the houses being built of earth in their lower and of reed in their upper part. You arrive at Aser, the whole country which you pass being thickly inhabited, and most rich in cattle.

2nd. Birni Silámin, a well inhabited place, having a wall in decay; the people dwelling outside of the town since the Fellani conquest. Arrive between 1 and 2 o'clock P.M., after having passed a great many villages.

3rd. Keeping always on the northern side of the river of Sókoto (called Gindi), which runs due N. Arrive about Aser at the town of Awgi, consisting of two separate quarters, but inclosed by one wall. The market is held between the town and the river. The town belongs to the kingdom of Sókoto Gando, the residence of Khalíf being distant 2 days to the S.E.

4th. Gúlma, a large walled town, situated on the northern shore of the river of Sókoto, which is always to your left. The town, belonging to Kébbi, is inhabited by an energetic set of people. Arrive before noon.

5th. A small village called Koido, about noon. All the country well cultivated, and plenty of villages. Cross the river in the morning and lose sight of it.

6th. Kúka, a walled place, of middle size; houses, except the house of the governor, are built of reed. Arrive about noon. The direction always W.

7th. Birni Débe, a walled place, but thinly inhabited; the wall being in decay. Salt is found here under Gando.

8th. Fúga, a group of villages, situated on a wadi running S.W., and always containing water. The place is famous on account of its salt, which is dug on the border of the wadi. Arrive between 1 and 2 o'clock P.M. Between Debe and Fúga the land is uncultivated.

9th. Birni Kébe, a place of importance in former times. Kébe is the first place of the country of Zabérma which you reach on this road; while more to the N. this country stretches farther E. into the neighbourhood of Awgi. The language of Zabérma is the Songhai, the same as that spoken in Timbaktú and Aghadéz.

10th. Arrive at Tébe, a walled place, at present inhabited only by a Fellani, who levies the tribute on the villages scattered around. Between Kébe and Tébe, and between Fúga and Kébe, the country is not cultivated.

11th. Arrive at Támkala, a large place, built entirely of reed, with the exception of the house of the governor. There is here a rivulet close to the town, running N.W. The whole country which you pass on your road is thickly inhabited. Arrive between 1 and 2 o'clock P.M.

12th. Sai, a considerable place, of great importance on account of its situation on the Kawara, or Gímbala, or Isa, which you cross in boats before entering the town.

13th. Tshirgu, a considerable place. Arrive at sunset, after having passed many villages. Have left, the 14th day, a large town governed by the sultan Málu, or Madu. A short day, like the foregoing. The whole country flat.

15th. Téne, a town properly belonging to Gúrma, a province of Moshi, but now under Sultan Malu. The inhabitants have a peculiar language (that of Moshi?).

16th. Another place belonging to Gúrma. All short days, of from 6 to 7½ h. travelling.

17th. A considerable place called Merkebugu, inhabited by pagans, and governed by two different sultans, the one a Fellan, the other a native from Gúrma.

18th. Birni Mázu, built entirely of wood.

19th. Yaga, dependent on Khalíf.

20th. The frontier place of the territory of Yaga.

21st. Sleep in the Khalla.

22nd. Early in the morning arrive at a straggling village. The whole country flat; no streams of water.

23rd. Arrive at a place belonging to the territory of Libtáko.

24th. Libtáko, a large town, situated on a small streamlet running into the Kawara. It is the easternmost place of the kingdom of Khalíf, upon whom Ibrahim, the governor of the town, is dependent. Superior horses, being the finest he

had seen even in Morocco. Ibrahim is able to bring a thousand horse into the field, but is continually engaged in fighting with the Tawárik and the Auelimmiden.

25th. Sleep in the Khalla.

26th. Arribinda, a large town, situated between two hills, and ruled by a son of Mohammed Lóbbu, whose family governs all the provinces on the middle course of the Niger from Arribinda and Timbuktú as far as Jínne. From Arribinda you see the mountains of Humberi to your right, towards the E.N.E.

27th. Leaving Humberi far on your right, you reach the first town of Hamdalábi, a place of middle size, built entirely of earth, as is the mode of building through all this country from hence eastward; the height of the rooms being just that of a man. The country mountainous, but the road level, the mountains being on both sides.

28th. A considerable town called Jilgód. The inhabitants, though Moslims, belong to the sect called Materalá, and have very peculiar ideas. On your whole road you leave the frontier of the extensive kingdom of Moshi about a day's journey to the S.

29th. A considerable place belonging to the territory of Jilgód.

30th. A place called Lúro, whose houses, built one close to the other on the outside, form a kind of wall. All the water taken from wells.

31st. A place called Mundóro, situated between mountains, accessible only from the N.E.

32nd. A group of villages, called Bóne, entirely inhabited by Fellani, and situated in a mountainous country.

33rd. Dálá, situated at the foot of a mountain, and governed by Modám Belala, who has about 500 horse. The Fellani here have preserved their former energy and martial spirit; and do not wear wide clothes like those established in Haussa, but tight ones, more resembling our close shirts.

34th. Reach Duénza, a large town, situated at the foot of a mountain, at the summit of which there are pagans. A stream of fresh water rushes down from it. The country is mountainous, but the mountains are isolated. From Duénza you behold the highest top of the Humberi mountains, called Wáka, about 2 hours to the N., of equal height to the Gélawi in the high Atlas.

[While Haj Ibrahim continues his route to the W. to Hamdalábi, the Sherif takes here the northern direction towards Timbuktú.]

35th. Sleep in a village, where you arrive between 1 and 2 o'clock.

36th. A place inhabited by Bambara people, but under M. Lóbbu.

37th. Kanfama, a considerable place, situated on a tributary of the Kawara, and the residence of a governor. The place is entirely built of earth. The principal food of the inhabitants consists of rice and fish.

38th. Before noon reach another small branch of the Great River, where a Túarig tribe, called Kálissúk, have their tents or huts.

39th. Arrive at Saraiyámo, a large town, residence of a governor, and situated upon this tributary.

42nd. Reach Kábéra, after a 3 days' short navigation, having embarked at Saraiyámo; the road by land being most dangerous on account of the roving parties of the Túarigs. There are a great many villages on the banks of the river.

43rd. After a 3 hours' march, through deep sand covered with wood, you reach Timbuktú.

There are three different sultans in Timbuktú; one belonging to the Fellani, one to the Túarigs, and one to the Arabs. The Fellani 45 years ago entered Timbuktú. The Túarigs, or rather the Auelimmiden, or Súrgu, are represented by their sultan Nabera, who has a force of from 7000 to 8000 horse, but who very seldom comes to Timbuktú. Perhaps still more powerful than these two is Hámed el Bekai, the brother of the celebrated sheikh El Mukhtar, who from Mabrak had come to Timbuktú, and, supported by the merchants and by his reputation for sanctity, established his authority. He died six years ago, when the Fellanis in vain tried to expel his brother.



2. Route from Sakatú to Timbukú viá Hamdalláhi,\* according to the Felláni Haj Ibrahim.

(From Sókotó, direction W.)

[Before giving the itinerary of Haj Ibrahim, which is not so rich as that of the communicative Sherif, I must observe, that Ibrahim travelled in the rainy season, during which the Kawara inundates all the country around its banks.]

3rd day. In the morning arrive at Gándo, the capital of those provinces of the Fellani empire which are situated on the lower course of the Kawara, and the residence of Khalíli.

5th. Ambúrso, a considerable town, situated on a small stream. On your road you have hills on both sides.

7th. Kébbi, a large town, larger than Kúka, the capital of Bornú, situated on a tributary of the Kawara. The town has six gates. The name of the sultan, who is dependent upon Khalíli, is Othmán Magáji. The inhabitants speak the Hausa language. Much rice is cultivated.

12th. Támkaia, built of reed, but surrounded by an earth wall. On the fourth day after leaving Kébbi you leave the large place called Debe at a short distance to your left. The language of the natives is called by my Fellani informant, Jérma, which he says is identic with Songhai, as is really the case, for Jérma is nothing but Erma.

16th. Sai, a large town surrounded by an earth wall, and in the interior built partly of earth and partly of reed, situated on the W. shore of the river. The language of the natives is Jérma, or Songhai.

[According to Ibrahim, from Sai there are two roads leading to the W.]

18th. Tshíngu, governed by Gelaije, who in former times has been sultan of all Másena, whose sultan is now Sheikh Omar.

19th. Sultan Madur.

21st. Meribéguí, a considerable place.

22nd. Yage, governed by a Fellani of the name of Sajo; Fellani and Jérma being the languages spoken in the town. Durra is the principal food of the inhabitants. The country is covered with villages, separated here and there by forest. It is rich in trees, and irrigated by small streams.

26th. Arrive at Dóri, the Fellani quarter near Libráko, which is the reason that both names begin to be used for the same place. In Dóri, which is built entirely of reed, there is a Fellani governor called Amrí. In the rainy season there is a large lake, 2 days long, to the N. of Dóri, navigated by boats.

29th. Arrive at Arribánda, a large place, the first one of Másena from the E., but under the Fellani. The natives speak the Songhai language. There is a considerable market held here on Saturdays. The country which you pass during these two days is very mountainous, and though inhabited, is full of elephants and lions. There are in the rainy season pools of standing water.

32nd. Silgodi, a large town, whose houses are built of earth and reeds. Only a few hills. Pools of standing water.

35th. Early in the morning you reach a middle sized place of Másena called Kóhá. The country flat, and full of fine trees. Much cotton and ghussub.

39th. Umbori (Húmberi), a large place, in a mountainous country, rich in rivulets, and thickly inhabited.

41st. Early in the morning arrive at the large town of Dálá, whose governor is Móri Bóie, a Fellani, like most of the inhabitants.

42nd. In the evening Dúmza, a large market town, in a mountainous country, rich in rivulets, and shaded by large trees.

43rd. About Aser réch: Dúmbara, a large town. No trade. Razziás.

44th. Nimiñaba, a middle sized place. Country hilly.

45th. Boré, also a large town. The gardens, which produce cotton, rice, corn, &c., are watered by channels. Mountainous.

\* El Hamdu-lilláhi (Praise be to God) was visited by Caillié, who miswrote the name *El Lumdu lillahi*. It was probably the place of pilgrimage visited by Alex. Scott. See Cooley's "Negroland," Note 160.—Ed.

47th. Timme, a large town, and seat of a governor. On the road you behold the Kawara, or rather its inundations during the rainy season, at a little distance to your right. The principal produce is rice.

49th. Reach a town bearing two names, being called Konna by the Songhai people, and Karí by the Fellani. Seat of a governor, and a considerable market-place.

51st. Niakóngo, governed by Haj Modi, the brother of Haj Omar, the Sultan of Másena. During the rainy season the waters of the Kawara approach the town within a short distance.

52nd, early, Fatóma. A mountain is to your left on the road.

53rd. Hamdalláhi, a very large town, the capital of this part of the Fellani empire, whose sultan at present is Ahmedu, the son of Mohammed Lábba. A long day's journey.

Hamdalláhi, which, like Sókotó, was built by the Fellanis, is at a short distance from the S. E. branch of the Kawara, at the point where Konna is situated, and about 5 hours from Isáka, which by the Fellani is called Maio Baléu, or the Dark River, while the N. W. branch is called Maio Rauéu, or the White River. But leaving at present the river and the island Rúde, inclosed by its two branches, I add an itinerary

*From Hamdalláhi to Timbuktú,*

according to a learned man, Haj Mohammed ben Bú-Bakr, a native of Hamdalláhi; to which, after an absence of eleven years in Yemán, he is returning.

1st day. Fatóma, a large town, at a great distance from the river, with a considerable market. Dukhen and dúrra the productions of the soil. The wells very deep, from 60 to 70 dra. A long day's journey, in an easterly direction.

2nd. Uronéma, to the N., a large place of the Fellani, belonging to the tribe of the Feraibe, who possess plenty of cattle. The country flat; mountains towards the S.

3rd. Kóna (not to be mistaken for the above-mentioned place of the same name situated farther down the river; and in former times on the island Rúde), a large town, at a short distance from the Bahr el Azrek, and is the market-place for Moshi. The inhabitants of Kóna belong to the Songhai.

4th. Koisa, a considerable place, inhabited by Fellani, with Sheikh Mohammed, and situated close to the river. Rice and dukhen are the principal products.

5th. Sennegebúlu, a small village of the tribe Urubé, situated close to the river. Sennegebúlu is the last place of the territory of Hamdalláhi in this direction, and Hamid's territory begins.

6th. Déra, another place of the Fellani, of the tribe Gimbéle, with three subdivisions, the Injebtóbe, the Fittóbe, and the Andéjiga. Their chief is called Síd. A long day, from sunrise till sunset.

7th. Ummére, a small village, with a mixed population of Fellani and Songhai people. A short day.

8th. Dóka, a village of the Gimbéle-Fellani, far from the river. Between 1 and 2 o'clock P. M., as in general.

10th. Early in the morning arrive at the large town Gúnki, situated upon the river.

11th. Korobóngo, a small village.

12th. Koro-díngi, another small village, whence a small river, winding towards Gúnki, flows into the Kawara.

14th. Arrive before noon at Kákuru, a large town, inhabited by Fellani, and governed by Sultan 'Ali. The whole country is thickly cultivated.

16th. Orogónia, a large place, inhabited by Ulemas of the Fellani, and surrounded by a great many small villages.

17th. Kábara, after having crossed the Kawara. (My informant tells me that Kábara is almost entirely inhabited by Songhai people.)

18th. Timbuktú.

*Route from Timbuktú to Hamdalláhi. (Westward.)*

(Slow travelling, about 4 hours per day.)

1st day. Gonía, a group of villages.

2nd. Tshílli, the same.

- 3rd. Kúra, situated on an island in the Blue River, which is crossed. Fine trees.  
 4th. Dira,\* a considerable place on the W. bank.  
 5th. Tshóki (Choki), a large walled town on the Lake Télé.  
 6th. Tindirna, on the river.  
 7th. Anya, a large group of villages to the N. of the Blue River. (Up to this place the inhabitants are Songhai.)  
 8th. Farinaka, inhabited by Fulán.  
 9th. A village of the Gimbóla-Fulán.  
 10th. Konári, another of the same.  
 11th. A market-town, inhabited by the same.  
 12th. Gíroe, a large town.  
 13th. Hamtalláhi.

[For the following the Editor is indebted to the politeness of Dr. R. Pauli, Secretary to the Chevalier Bunsen.]

The first and greater part of Dr. Barth's Report about Aghades was despatched from Tintellust before the expedition started for the Sudan. The rest arrived, accompanied by letters to the Chevalier Bunsen, dated Kanó, Empire of Bornú, 25th and 28th of February, 1851.

It appears that in the beginning of December last the travellers had left the country of Ahir, and a little after Christmas they crossed at Damergu the frontier of the Sudan. On the 11th of January the three separated. Mr. Richardson went by Zinder straight towards Kúka, the capital of the Emperor of Bornú; Dr. Overweg made a geological excursion to Marraji and Gober; and Dr. Barth proceeded south, wishing, if possible, to explore the country of Adamawa, and the waters that feed the Niger from that hitherto unknown district.

Deficiency of means, however, hindered him from going farther than Kanó, from whence he intended to take the shortest road, to Kúka, in order to join Richardson and Overweg, who likewise had used all their goods, and hoped to find a new supply deposited with the Emperor of Bornú.

Dr. Barth's road from Damergu to Kanó passed by Tasana and Katshna, through a wild forest land, rendered unsafe by plundering gangs of Fellanis. The Sultan of Katshna, who governs part of the country of the Fellanis, detained Dr. Barth some days, until he extorted from him a high passage money.

The power of the Sultan of Sakatú is described as kept up only by the imposition of large tribute upon caravans, the whole country being in a poor and decaying condition, whereas in Bornú a very flourishing state of things is, on the contrary, visible, and European travellers meet everywhere with a kind reception.

The land around Kanó is very fertile and admirably cultivated, being the richest province of the empire. The season, however, when Dr. Barth paid a visit to this place, was very unhealthy. This circumstance, added to the low state of his finances, rendered it necessary for him to hasten on at once to Kúka.

Soon afterwards arrived the melancholy news of the death of Mr. Richardson, which took place on the 4th of March, from dysentery, on the road between Zinder and Kúka. Dr. Barth, whose letters are dated Gúmmel, March the 14th, and Kúka, April the 3rd, received the intelligence of the death of the leader of the expedition on the 25th of March, and hastened on to the capital of Bornú, in order to make the necessary arrangements. Having, upon his arrival at Kúka, found no supplies, he borrowed some money from the Vezir, El Haj Beshir, of whose kindness throughout he speaks in the highest terms.

On the 13th of April he mentions having received the gratifying intelligence of the safety of Dr. Overweg, who was on his road to Kúka, and that the latter had written to Professor Ritter, of Berlin, on the 10th of April, from Zinder. On the 28th of the same month Dr. Barth gives a short notice of his first excursion to Lake Tsád, in the jungle surrounding which, he had been on horseback four days—

\* Said to be the place of origin of the Sourai (Songhai), who are probably identical with the Erná, a section of the Senhaja, spread over the whole country towards the E.

half the time in water; at times up to his horse's back. Owing to the difficulty he experienced in finding the lake, he began to suspect that, after all, it was but a succession of swamps.\* After having at length succeeded in penetrating through the mass of jungle, high grass, and forest, he arrived in sight of the lake, and visited the landing places between Angornú and Kawa.

On the 7th November the Chevalier Bunsen received several letters which had arrived at Tripoli with two mails, the latter of which had come all the way from Kúka in the short space of fifty-six days. The dates of the letters are from the 10th of May to the 10th of August.

It appears that Dr. Overweg, who returned from his expedition to Marraji and Gober by way of Zinder, joined Dr. Barth in Kúka in the first week of May. After having arranged the most necessary affairs of the late Mr. Richardson, Dr. Barth started, on the 29th of May, for Adamawa, the Sultan and Vezir of Bornú supplying him very kindly with everything necessary. He proceeded in a south-eastern direction through the country of the Marghi—a heathen negro tribe which separates the Bornúese from the Fellatas, and supplies the slave markets of both. They have their own language, and worship in sacred groves; their principal image being a granite rock in their chief town, Kobtshi.

At Mora, the capital of the Mandara country, Dr. Barth first saw the mountains of that name. They are not a connected chain, crossing central Africa from W. to E., but extend into plains towards W., S., and N. The mountain-range which figures on the maps under the name of Mendif, is nothing but a very steep single hill, which is surmounted by a Fellata village.

At Issege, a few miles S. of Mora, he crossed a rivulet coming from the S. and flowing towards the Shary.

Uba, the first town of the Fellatas, is about 190 miles from Kúka, at the foot of the mountain, which consists only of huge granite rocks. The country of Adamawa has fine pasture grounds, and produces excellent cattle. The Fellatas till the ground only by means of slaves, which, with ivory, form their principal objects of export.

Fifty-two miles farther on is a place called Saraw; and 34 miles beyond that, not far from Sulleri, Dr. Barth discovered, on the 18th of June, the two principal rivers of Adamawa—the Benué (undoubtedly identical with the Tshadda, which falls into the lower course of the Niger) and the Faro, both of which rivers join at a place called Taëpe. The Benué, said to be here nine days' journey from its origin, comes from the E. and S.E., is half an English mile broad, and about nine feet deep. The Faro is only half a mile broad, with a depth of from three to four feet. Dr. Barth crossed them both not far from their junction, the first in a canoe, the second on horseback. The very strong current flowed due W. The waters rise from the end of June until the end of September.

Dr. Barth reached Yola, the capital of Adamawa, on the 22nd of June; but Mohammed Loë, the Sultan of the Fellatas, obliged him to leave that place after three days' residence, because he came from the Sheikh of Bornú, the enemy of the Fellatas, and was not provided with a recommendation from the Sultan of Sakatú, whose slave he boasts of being. The Doctor arrived at Kúka on the 22nd of July, satisfied with having established the position of the watershed between the rivers flowing into the Niger and those running into the Lake Tsád. As his guide, Mallem Katori, was detained by the Sultan at Yola, he hopes to hear more respecting this important country of Adamawa upon his return to Kúka.

In the mean time Dr. Overweg had put the boat together which had been carried all the way from Tripoli, the Sheikh and his people taking the greatest interest in the performance.† On the 18th of June the boat, carrying four guns, was launched, christened the 'Lord Palmerston,' and hoisted the British flag. Dr. Overweg started the next day from Bree, a small place near Kúka, on his first voyage on the lake. After sailing 12 miles he touched at the first island, of which there are very many, all covered with wood, full of inhabitants, and abounding with hippopotami and elephants. The eastern coast of the lake called *Kanem-Wadai* is not more than 60 miles distant from Bree, but the lake seems to extend from N. to S. still more. It is from 10 to 15 English feet deep, the water being sweet and clear.

\* The same occurred to Major Denham.

† There are with the mission two English sailors; a carpenter and another.—Ed.

Mission to Central Africa

the country of Borgú in a N.E. direction, dries the lake when the waters have been dried up altogether,

the islands, are pirates, and are contented with Wadai. They use very long poles, but propelled by long poles. Dr. ... as everywhere well received by the ... him back to Kúka. He was prevented ... tribes from exploring the northern and ... the 8th of August to Kúka, where he was ... from Europe: the long-desired letters, a ... M. the King of Prussia having arrived.

letter with the news that the old Sultan of Wadai, Constantinople, was just dead, and that there was some ... The intelligent and amiable Sheikh of Bornú is very ... iron of European boats on the lake, and promises every ... to the mission.

ject that it would occupy twelve months to finish their examinations of the lake on the E. and N., as yet almost entirely unexplored, ... country of the Baghermis.

and goods which had been sent out by the British Government for ... Richardson had, by Lord Palmerston's orders, been placed at their ... to enable them to carry out the objects of the mission. They had already ... themselves of the favourable disposition of the Sultan of Bornú to conclude ... him; on the part of England, a treaty of commerce, which may be considered ... the first step towards the substitution of a commercial intercourse and exchange ... of the rich products of that part of Africa for the slave trade.

The ultimate object of the travellers is still to endeavour to cross the centre of Africa in a S.E. direction: to the coast of Mombas or to Mozambique, for which purpose they have already found an experienced guide and collected much valuable information.—Ed.

[The following text is extremely faint and largely illegible, appearing to be a continuation of the narrative or a list of notes.]

## APPENDIX.

XII.—*Proceedings at the South Sea Islands.* By Capt. J. E. ERSKINE, R.N. Communicated by the Admiralty.

[Read March 10, 1851.]

*Her Majesty's Ship "Havannah,"  
Sydney, October 10, 1849.*

SIR,

I HAVE the honour to acquaint you, for the information of my Lords Commissioners of the Admiralty, that having been assured by the Governor-in-chief of New Zealand of the satisfactory state of affairs in that colony, and that there was no probability of any disturbance taking place, I sailed from Auckland in her Majesty's ship under my command, on the 18th of June, leaving orders for the "Fly," shortly expected from Sydney, to remain on that part of the station during my absence. I anchored in the Bay of Islands the following day, and remained till the 25th, when, having ascertained that every thing was quiet in that neighbourhood, and likely to remain so, I proceeded to the Samoan or Navigator Islands, heaving-to for a few hours off Nine or Savage Island, on the 6th of July. Having found out from the natives who flocked on board that there were no English missionaries or white persons on the island (although I believe there is one native Christian teacher established there), I continued my course to Tau (incorrectly termed Manua on the charts), the weathermost of the Navigator group; heaving-to to communicate with the chief and missionary on the 8th. On the 9th I entered the harbour of Pago Pago, in Totuila, remaining till the 12th; and anchored at Apia, in Upolu, where her Majesty's consul, Mr. Pritchard, resides, on the 13th. From Apia, I visited in boats, accompanied by the consul, the harbour of Saluafata to the eastward, and the island of Manono to the westward, and sailed for the Friendly Islands on the 25th. I anchored in Port Refuge, Vavau, on the 30th; and at Lifuka, the residence of the king of the whole group, on the 1st of August. Having waited on King George, and afterwards entertained him on board, I proceeded to Tonga-tabu on the 4th, quitting the Friendly group finally on the 9th of August.

Thinking it advisable to visit all the missionary stations at present maintained in the Feejee Islands (four in number), I communicated with Lakemba, the station for the windward portion of the group, on the 11th, and anchored at Levuka, in the island of Ovolau, on the 12th. From this harbour I visited Vewa, the head-quarters of the Wesleyan mission; the two resident missionaries, the Rev. Messrs. Lyth and Calvert, accompanying me the following day to the neighbouring island of Bau, the capital and residence of Thakambau, Tui-Viti-oos, head chief of Feejee. This chief having returned my visit on board, I remained at Ovolau till the 18th, going then to Nandi, and Bua, or Sandalwood Bay, which latter I quitted on the 22nd. Returning to Ovolau to land the pilot, I made sail for the New Hebrides on the 27th; and calling off Aneiteum on the 30th, anchored in Resolution Bay, Tana, the same day. Having sailed round that island, communicating occasionally with the natives, and looked into Dillon Bay, Erromango, on the 1st of September, I visited Vate, or Sandwich Island, Jengen, in New Caledonia (where I found the

chief a very well disposed person), and the three Loyalty Islands—Nea, Lifu, and Marr, in succession, arriving at the island of Pines (at which place, as at Aneiteum, some Sydney merchants have formed an establishment for collecting sandalwood, &c.) on the 20th of September. On the 22nd I sailed for Numea, a district on the western coast of New Caledonia, where affrays have taken place with the crews of sandalwood traders (several of whom have been killed during the last two years), touching at different points where communication could be had with the chiefs. Having made all the inquiries possible, consistent with our ignorance of the New Caledonian language, and the secrecy generally observed with respect to all occurrences on these coasts, I quitted them on the 28th, and arrived at Sydney on the 7th of October.

So many different groups of islands have been visited during this cruise that, to prevent confusion, I have thought it advisable to draw up a Report upon the present state of each, and of my proceedings thereat: and I take the liberty of calling their Lordships' attention to that on the New Hebrides, New Caledonia, and the Loyalty Islands, places little known, except by the sandalwood traders, but which, from their proximity to our Australian colonies, the nature of the trade carried on with them, and the consequences likely to ensue, appear to require more immediate attention than any of the other islands in this part of the Pacific.

H. G. Ward, Esq., M.P.,  
&c. &c.  
Secretary, Admiralty.

I have, &c.  
(Signed) JOHN E. ERSKINE, Captain,  
and Senior Officer on the Australasian Station.

*Samoan, or Navigator Islands.*

1. Any report I can make on the state of affairs in these islands must be considered only as supplementary to that of Captain Maxwell, of the "Dido," with a copy of which he furnished me, and in whose opinions I beg to express my full concurrence.

2. Captain Worth, of the "Calypso," will have acquainted their Lordships that the war which was pending during the visit of the "Dido" to Upolu, shortly afterwards broke out, and, I am sorry to say, still continued when I arrived there. The war canoes belonging to the Manono party, which had been seized by Captain Worth and detained in the custody of her Majesty's consul as a pledge for the payment of 608 dollars 25 cents, short of a sum of 1625 dollars 50 cents, demanded as an indemnification for losses suffered by foreigners at the hands of that party, were soon after returned by Malietoa; and as a proof of the pacific feelings of that and the other chiefs towards Great Britain, I may mention that after the sailing of the "Calypso," these canoes remained merely hauled up in Mr. Pritchard's enclosure, without any attempt being made to recover them until regularly redeemed.

Among the items charged against Malietoa, the principal one, of 1000 dollars for "Sunderland's chapel, burnt," refers to a large chapel in the district of Aana, destroyed when, according to national custom, the villages of that district were burnt by their enemies. This chapel was built (as is usually the case) by the natives themselves; and is situated on ground the property of the public, or, as it is here termed, "the Land of the Sons of the Chiefs." It also appears to be somewhat doubtful if the building in question was intentionally set fire to; and even if it were, the war party seemed to have considered it merely as their enemy's property, as they took particular care to prevent the fire reaching an adjoining house, containing the printing-press of the London Mission Society.

After reparation was made, and the sum or equivalent required for this chapel paid by Malietoa, the missionaries waited on him, and offered to return

it, according to Samoan custom; but it was declined; so that the articles representing that value still remained with Mr. Pritchard. The other sums were, I believe, paid to the respective persons on whose behalf they had been demanded, and no complaint or allusion was ever made to me by any of the chiefs during our stay, with respect to the indemnification thus paid by them.

Malietao, with his war party, remained, however, at the fort of Molinuu, within a short distance of Apia, although Captain Worth had stipulated that he should remove from that locality. It may be here remarked, that although Malietao is the chief of the highest family, and generally considered the leading man of the Manono party, he has, in fact, no more authority, in a military point of view, than any other chief, all affairs being settled by a "fono," or general council, where each little district has its deputed speaker. When his name alone is mentioned therefore, it by no means follows that the acts spoken of are to be attributed to him personally, but to the whole of the party with whom he is connected.

3. On my arrival at Apia I found this to be the situation of affairs, the war on the part of Manono consisting more in keeping their runners out of possession of their lands, and paltry forays, than in regular engagements; and on that of Aana, who were residing with their allies of Atua, in being prepared against attacks. As no complaint whatever was made by her Majesty's consul, or any other British subject, of the behaviour of either party towards them, I did not consider myself justified in insisting on the evacuation of Molinuu, or in interfering in any way in the war, except by mediation. With this view I proposed to Malietao to visit me on board, which he did immediately, but I found he had very little power, and was afraid of committing himself; some points of etiquette interfering with the arrangement of their differences, more than any real cause of complaint on either side. Two days afterwards I went—accompanied by her Majesty's consul, and Mr. Williams, consul of the United States, who acted as interpreter—to Salafuata, near which port is situated Lufi Lufi, the head-quarters of the forces of Aana and Atua, and had an interview with the chiefs. These men declared themselves most anxious for peace, desiring only to return to their own houses, and to be permitted to live on an equal footing with their neighbours; and in this I believe they were perfectly sincere.

Captain Maxwell having so clearly explained the causes of this war, it is unnecessary for me to recapitulate them; but it should be remarked that this differs from former wars in the existence of a large neutral party who refuse to take part in hostilities from religious feelings, although, belonging as they do to the people expelled, they are equal sufferers with the others; and their forbearance is the more remarkable, as, were they to unite their forces, they would be strong enough to finish the war at a blow.

These men were very desirous that I should mediate between the parties, and use my influence in obtaining permission for them to return to their lands, and I consequently exerted myself to procure this arrangement, but without success. I am not without hope, however, that the influence of this party, the probable desertion of some of Malietao's allies from the neighbouring island of Savaii, who wish to return to their homes, and the knowledge of the disapprobation and contempt with which these paltry wars are looked upon by Europeans, will shortly cause a cessation of hostilities; especially as the Manono party can have little or no hope, in the altered state of affairs, of retaining the "malo," or governing power, by their continuance.

I addressed, in the course of communication with them, several letters to the chiefs of both parties, urging them to compose their differences, and unite in forming a regular government, which could alone make their country prosperous and respected. I also recommended the adoption of a national flag, there being at this time one or two small vessels sailing out of the port of Apia under no colour whatever, which, should their trade increase, might be a serious



matter of inconvenience to themselves and others. These recommendations were very well received, particularly by the neutral party, and I have no doubt will meet with attention when the war is brought to an end.

4. There are very few foreigners who are not subjects of Great Britain in these islands, and the conduct of the natives towards all of them, from her Majesty's consul and the missionaries downwards, is in the highest degree kind and respectful. I do not believe there is a country in the world where a white man, but more particularly an Englishman, may consider his life and property more secure, even in the middle of the distractions of war, than in this. On my visiting the district of Lulumorgâ, 20 miles distant from Apia, in one of the ship's boats, whether the whole of the Manono force had gone on a war expedition, our party landed in the midst of them with the utmost confidence, and a display of arms on our part would have been considered as unnecessary and unusual as in any part of England, nor does any foreigner ever think of carrying arms for his protection. The plunder now and then complained of consists of occasional thefts (never accompanied by violence) committed in the provision-grounds during their owners' absence, and appear to me to be far fewer than would occur in any other country under like circumstances. In the few cases of wrecks which have lately happened the people have all been well treated; and although in one or two instances attempts have been made to keep some of the property saved, it has always been given up on a proper demand being made to the chiefs: and it should be remembered that here, as in all the Polynesian Islands before the introduction of Christianity, wrecks were considered offerings made to the gods.

Mr. Pritchard also informed me, that the difficulties first encountered by him in procuring a site for a house, &c., have been removed, he having now purchased as much as he requires for that purpose; and that the practice of killing his horses, which arose from ignorance of their use, and the damage done by them to the young bread-fruit trees, is quite discontinued.

One case in which redress was claimed by Captain Worth, on behalf of the British subject named Thomas White, for an assault committed on him by some natives of a village named Samatau, in July, 1845, remains unsettled; but the chiefs acknowledge the wrong, and promise redress at the termination of the war, the village in question being at present deserted by its usual occupants.

5. The great disadvantage these islands (especially Upolu and Savau) lie under is the want of anything approaching to a government. Even where the "malo," or power, was with any district or party, it seems never to have been exerted in making laws, but in oppressing their neighbours. There exists a code of Commercial Regulations, drawn up by Captain Wilkes, of the United States Navy, for the whole of the Samoan Islands, signed by some of the principal chiefs of Upolu; but there is no authority to enforce any of its enactments. A harbour duty of five dollars is paid by all merchant ships to Pea, or Foneis, chief of Apia; but it is looked upon in the light of a private present, and serves no purpose but that of throwing a little more money into the hands of the European traders. Were the present vexatious wars at an end, it would be very desirable that the attention of this people should be turned towards the formation of a code of laws, and the establishment of some authority strong enough to put them into execution. From their oratorical habits, and the custom of determining everything in "fonos," or councils, which are conducted with admirable order and great politeness, I should think them much more fitted for the arts of government than for war, for which they certainly have no genius. I have no doubt the influence of her Majesty's consul will be directed towards this most desirable object when peace will admit of it; and I am sure that any suggestions from an officer in her Majesty's employment will always receive attentive consideration from the natives.

Only one complaint of the conduct of a British subject was brought before

me by some of the chiefs, and that was merely of the practice of overreaching them in money transactions. I took the opportunity of acquainting the individual, however, that the chiefs had full power to remove from the country foreigners who did not behave with obedience to the laws they might think proper to make; and that should any well-founded complaint of bad conduct be made to me, accompanied by a request that the person offending might be removed from the island, I should not hesitate to comply with it. I believe this intimation will have a good effect among the British residing here; who, however, are in general very well behaved.

6. From the smaller group of Manua, and the island of Tutuilla, I had no reports but of the most satisfactory nature. The whole of the population of the former, and nearly all of the latter, have embraced Christianity; and both have absolutely refused to take any part in the war. Tutuilla has the advantage of some form of government; there being seven ruling chiefs, who decide upon measures for the general adoption. I was informed that the small portion remaining of the heathens (not above 100) would willingly have joined their brethren in Upolu, but are prevented by the decision of the chiefs, who have prohibited all intercourse with that island during the continuance of hostilities. Several chiefs whom I met at Pago Pago, particularly Mouua, the head of that district, spoke to me of their strong attachment to Great Britain, and their determination to cultivate the arts of peace. No complaint of any kind was brought to me at either of these places.

7. From all the accounts I could collect, the population of these islands seems to be diminishing, more particularly during the last year and a half, principally from the effects of the *hooping-cough*,\* supposed to have been brought from Tahiti, about ten months since, and which has run through the whole of the group. The number killed in the war is inconsiderable, and is not estimated at more than 200 since its commencement; but the diseases incident to bad food and exposure are said to have occasioned a considerable mortality. Those best acquainted with the subject consider the diminution to be not less than 5 per cent. during the above period.

8. The natives are beginning to have a good notion of the value of money, particularly at Apia, where many whalers touch, who trade also, and where goods may be bought from several storekeepers. The islands seem fit for growing every tropical production, and there is a great quantity of rich level land in all. Their only staple, however (with the exception of a little arrow-root, which fetches a tolerable price in the Sydney market), is cocoa-nut oil, worth on the spot 12*l.* a ton, and sells in London for 40*l.* Their contributions to the Missionary Society are generally made in this oil, and they also barter it for goods with the storekeepers. The greatest quantity produced in any year has not, however, exceeded 100 tons; the result, probably, of a few weeks' labour. Tea times that quantity might be raised without any difficulty from the present trees, as immense numbers of cocoa-nuts are left to perish;

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\* In the discussion which followed the reading of the paper with respect to the extraordinary mortality amongst the natives of the Samoan Islands from hooping-cough, it was mentioned by Sir Woodbine Parish as worth notice perhaps under such circumstances, that amongst the people of South America, where hooping-cough was almost as much dreaded as smallpox, vaccination had produced a very remarkable modification of the disease in a great many cases when it had been applied to children and others labouring under severe attacks of it. So much so, that when vaccination was first introduced at Buenos Ayres, it was believed for some time by the medical men that it was a specific not only against one, but against two of the most fatal disorders of that part of the world. Mr. Catlin afterwards stated, that amongst the North American Indians, where hooping-cough was very fatal to the tribes in the far west, the same idea prevailed as to the efficacy of vaccination in cases of that complaint, as well as against smallpox.—Ed.

and should they turn their attention to planting for the purpose, it is impossible to say to what amount this valuable article might be produced.

A few small vessels trade from Sydney, but the wants of the people are principally supplied by American whalers, who, as mentioned above, trade also. There are a few cattle on the island, most of them the property of Mr. Pritchard and Mr. Williams, the consul of the United States, who supplied us with good beef at a moderate rate, as well as yams and pumpkins. From both these gentlemen I received every assistance during our stay at Upolu, as well as from the missionaries, whose influence with the native population is deservedly great.

9. No foreign ships of war have visited these islands for several years, but vessels connected with the French mission occasionally touch at Upolu and Tutuila. There are two priests, members of this mission, who have small congregations in the neighbourhood of Apia. They seem to be quiet, inoffensive men; but no cordiality exists between them and their Protestant brethren.

10. Before leaving New Zealand the Governor-in-Chief of that colony had supplied me on their behalf with some useful articles for presents to those chiefs of the different islands, who might be considered entitled, from their attachment and respect to her Majesty's Government, to this compliment. Such favours I found were very much esteemed, more from the proof thus afforded of the remembrance they and their country were held in by the British Government, than from the intrinsic value of the present, which was generally small. To the chiefs of Manua and Tutuila, and the chief of Apia, attached to the neutral party, I accordingly paid this mark of her Majesty's favour, and I feel sure it will be gratefully remembered.\*

### Friendly Islands.

1. The whole of this group, comprising Vavau, with numerous smaller islands; those of Habai (the principal of which are, Foa, Lifuka, Ovotayu, and Namuka), and the island of Tonga-tabu, are at present under the dominion of George Tobou, who unites in his person the dignities of King of Vavau and Habai, and that of Tui Kanakabou, which gives him the sovereignty of Tonga, to which latter he succeeded on the death of Josiah Tobou. This chief is, by all accounts, a very superior person, and what I saw of him tended to corroborate the general report. His authority is very great in Vavau and Habai (the population of which is almost entirely Christian), and is acknowledged in Tonga, although the heathen party, which comprises about half the population of that island (the whole being estimated at 8,000 to 10,000); do not readily yield him obedience. In consequence of this feeling, he usually resides at Lifuka, where I saw him, and where he returned my visit. The condition of Vavau and Habai is perfectly quiet; the Wesleyan missionaries having great influence, which they exercise with much advantage to the natives. At Tonga-tabu the heathen part of the population reside in three forts, of which one only, that of Bea, within three miles of Nukualofa (famed as the scene of the death of Commander Croker, of the "Favourite"), is kept in repair. Nukualofa is the town off which ships generally anchor, and is the head-quarters of the Wesleyan mission in Tonga. One of the heathen forts (Mua) has for some years past admitted a Protestant missionary, and both that and Bea have each a French Roman Catholic priest, who have made a few converts; but, as in Samoa, there is no feeling of cordiality, but the contrary, between the two sects. Should George Tobou live for a few years (and he is a man apparently about 45 years of age), it is probable that all the

\* For an interesting paper on the ethnology of these islands, see the Samoan Reporter of November, 1849.—Ed.

population will become Christianized, and the succession of his son be secured; but should his death happen at an early period, disputes will certainly arise as to the sovereignty of the different islands, and civil war be the consequence. Besides the dignity of Tui Kanakabolu, which gives the right to rule in Tonga, there is another and a higher one called Tui Tonga, the holder of which is considered to be a kind of sacred personage, and above the cares of government. It is said that the Roman Catholic party advocate for their own views the right of the present Tui Tonga (one of their converts) to the actual rule, and that the heathen party would perhaps assist them; but as the office must expire with the present holder, and he is imbecile, it is not probable that there will be much trouble on his account. George has, under any circumstances, the whole power in his hands at present, having governors at the islands where he is not actually present, and a regular Government at all, with laws for the punishment of offenders.

2. Before leaving New Zealand upon this cruise among the islands, the Governor-in-Chief of that colony communicated to me a correspondence which had taken place between his Excellency and Josiah and George Tobou, on the subject of the cession of the sovereignty of their dominions to the Queen of Great Britain, with a letter from her Majesty's Secretary of State for the Colonies, in answer to Sir George Grey's Despatch, desiring him to decline such offer on the part of the British Government, but to express her Majesty's friendship, and her desire for the advancement of prosperity, civilization, and religion in their islands.

Sir George Grey having requested me to deliver his answer to this effect to George Tobou, I did so accordingly, and took occasion to assert my conviction that the fear expressed in his letter, before alluded to, of the encroachments of the French (a fear which seems to be generally entertained among the islands of the Pacific), was groundless. The king, however, having lately been a sufferer from the threats of a French citizen, who, according to his account, had obliged him to pay a sum of 600 dollars as an indemnification for losses incurred in the island of Touga-tabu, by the acts of the natives, was very desirous that the facts of the case should be stated to the British Government. It appears that about two years since a French merchant named Maruc, having arrived with a cargo of goods at Tonga, received permission from the king, at the request of the Rev. Mr. Thomas, chairman of the Wesleyan mission, to establish himself there: his goods being deposited in the mission-house till a building could be prepared for himself. The natives, however, who have a great dislike to the French, burnt down two houses successively, whilst in process of removal to other sites which M. Maruc had purchased; the first from the king, and the second from another chief. The king being unable to detect the offenders, caused the purchase-money of both these houses to be returned to M. Maruc, who accordingly was no actual loser; and in process of time he was allowed to put up and inhabit another building. A vessel being about to sail for Tahiti, M. Maruc, however, had written a complaint to the governor there, of this treatment, and in a very few months the "Brillante" corvette arrived to inquire into the case. The king complains, that though unwell, he was ordered on board, when a severe lecture was read to him by the captain, and he was desired to be very careful in his treatment of French citizens in future. No indemnity, however, was asked for, as no loss had been sustained, and M. Maruc continued to reside on the island. A few months ago a small outbuilding attached to his house was again burnt down (the natives assert by the carelessness of his own servants), and a few articles of small value were missed, supposed to have been stolen. The king having caused all the neighbouring houses to be searched, without effect, M. Maruc demanded as an indemnification, cocoa-nut oil to the value of 600 dollars, threatening, that in the event of a refusal, a man-of-war should return and destroy the place, and hinting that his forbearance alone prevented

rigorous measures being adopted by the "Brillante" on a former occasion. The question was debated in an assembly of the chiefs, many of whom were indisposed to accord with the demand; but the king, taking (as he told me) the advice of the missionaries, persuaded them that it was better to yield than run the risk of more severe treatment by a ship of war. The sum of 600 dollars was accordingly raised by the people bringing a quantity of provisions which were sold to some whalers then in port, the king making up the balance of 174 dollars, being all the money he possessed; and M. Maruc departed in his own vessel for Tahiti, giving George an acknowledgment that he had no further claim on him. I believe there is no doubt that M. Maruc, during his stay on the island, had been constantly annoyed by the conduct of the natives, in spite of all the king could do to prevent it, and of the efforts of the Protestant missionaries, who cannot in this instance be accused of exciting the native population against a foreigner, as they had befriended him from his arrival. But the king naturally expressed great alarm at the prospect of demands being made upon him in this manner, fearing that it might be done, not merely with a view to extortion, but to the weakening his power, or ultimately depriving him of his dominions. I explained to him that complaints of the conduct of French citizens should be made to their own Government, who could not be supposed to entertain any such evil intention towards him, and would not willingly allow him to be imposed on. As the king, however, has no regular secretary or confidential person about him capable of drawing up any complaints of the kind, he has no means of taking such a step, and requested that I would acquaint the British Government with his situation.

3. It is certainly to be regretted that there is no consular or other agent of any European power in these islands to whom such disputes might be referred, and who could give the king advice and assistance in forming his government; which from his character, as well as his acknowledged authority, might be a tolerably strong one. Such an officer might also be of service in securing the succession of George's son, the only means of keeping these numerous islands united and prosperous. In a commercial point of view there seems no chance of their ever occupying a high position. They are of small size, and for their extent are tolerably well populated. Cocoa-nut oil, as in the Samoah group, is almost the only article of export of consideration to Europeans. There is some traffic, however, between them and the Feejees in smaller articles; and numbers of Tonguese go there to build their large double canoes, as they have themselves no timber fit for the purpose.

4. The few British in this group are generally well conducted, and no complaints were brought to me against any of them. Port Refuge, in Vavau, being the best harbour, and the most resorted to by whalers, there are more English and Americans there than at the other islands. Several applied to me to be taken away; but as some of them were under sentence of labour on the public works, for desertion from their vessels, &c., I declined to interfere in such cases. They are, I was assured, generally well treated by the natives, who are (both Christian and heathen) very well disposed towards the British. There can be little doubt that Christianity will, ultimately, become the religion of this people; but there does not seem much hope of a rapid progress in civilization. From the fruitful nature of their land, and the mildness of the climate, they have few wants unsupplied, and no stimulus to industry. The king, however, as mentioned before, is a very intelligent man, and several chiefs and others, educated by the missionaries, exhibit a tolerable share of ability.

5. I am not aware of any regular survey ever having been made of these islands, and they are certainly not laid down with any attempt at accuracy in any chart supplied by the Hydrographical Office. From the numerous reefs among the Habai group, the navigation is impossible, in the present state of

things, without a native pilot, with whom it is generally very difficult to communicate. Banks are also known to have been thrown up by volcanic action within the last few years.

*Feejee Islands (otherwise Fiji or Viti).*

1. This very fine group of more than double the extent, and probably seven or eight times the population of the Samoan, (as a reference to the size, &c. of the principal islands of each will show,\*) has been seldom visited by Her Majesty's ships, and is principally known from the account of Captain Wilkes, of the United States Exploring Expedition, who surveyed it in 1840, and the reports of occasional traders in "beche de mer" and tortoiseshell. The inhabitants are (as is well known) of a different race from the Polynesian islanders to the eastward, having more of the characteristics of the negro, although there is now a considerable admixture of Tonguese blood among them, from the numbers flocking here from the Friendly Islands, who are received on an equal, or even superior footing, and many of whom settle for life. The Feejeans are generally reputed treacherous, cruel, and cowardly; and with the exception of the greater part of the Windward Islands, (where the Wesleyan missionaries have made great progress,) and the smaller Christian congregations in the larger islands, they are certainly addicted to cannibalism, to a degree not generally known or believed in other countries, apparently more from the love of human flesh as an article of food, than as satisfying a feeling of revenge on the bodies of their enemies. Of this, a late example will be mentioned afterwards. They excel all their neighbours, however, in many of the useful arts, (such as building large canoes, and the manufacture of the native cloth and pottery,) and they are polite and ceremonious in their communication with persons whom they respect. The immediate authority of their chiefs, to whom much deference is paid, is very strong; the greater part of them acknowledging a kind of dependence on the chief of Bau, (or Ambow,) a small island on the coast of Viti Levu, which forms his capital, and may be considered that of all the Feejees. This man (whose father is still alive and shares his authority) is called Seru, or Thakambau, and has within a few years taken the title of Tui Viti, or King of Feejees. He is a person of considerable energy and better disposition than ordinary, being very kind to the white residents generally, and (although not professing Christianity) particularly so to the missionaries, whose principal station is at another small island, Vewa, (or Biva,) a mile or two distant from Bau. They have also at present three others—viz.: one at the island of Lakemba, to windward; one at Bua, or Sandalwood Bay; and a third at Nandi: the two latter on the south side of Vanua Levu.

2. Having touched at Lakemba on the 11th of August, where everything appeared to be going on well, I anchored the following day in the reef harbour of Levuka in Ovalau, from whence I visited the mission station at Vewa, and the island of Bau, the residence, as above-mentioned, of Tui Viti, accompanied by the Revs. Messrs. Lyth and Calvert, who kindly acted as interpreters.

3. I have learnt from the missionaries at Lakemba and Vewa, that in September or October last a plot had been formed by a young chief at Bua (or Sandalwood Bay) to murder the Rev. Mr. Williams, and plunder the mission

\* FEEJEE.—*Viti Levu*.—85 miles long by 40 broad. *Vanua Levu*.—95 miles long by 20 or 30 broad, besides numerous smaller islands. Whole population estimated at 300,000. SAMOA.—*Savaii*.—40 miles long by 25 broad. *Upolu*.—40 miles long by 12 broad. Whole population about 36,000.

stores there, but its execution had been stopped by its leader (by name Baaamu) being put to death by the chief of a neighbouring town, when his followers at once dispersed. I was also informed that a demonstration had been made against the mission station and Christian villages at Nandi, by the people of So-Lévu, (a neighbouring town,) in the month of April. In my interview with Tui Viti, therefore, (after expressing my satisfaction with the accounts I had heard of his treatment of the British missionaries and others,) I told him of my intention to visit those two stations, and inquire into the truth of the above reports. Of this he at once approved, although he informed me that there was now no danger of any harm happening to the missionaries, declaring that he would take care of Bua himself, and he spoke (I believe) with perfect sincerity of his good wishes towards the white people generally, and his desire to give them every protection and assistance.

4. As I had heard many complaints of the conduct of one or two of the resident Englishmen, I told the chief that if he could substantiate a case of misconduct against any of them, and express a wish that the offender should be removed from the island, the captain of a ship-of-war would convey such person away, but that no British subject would be permitted to be in any way ill-treated or plundered. At this he declared his full satisfaction, and on his alluding to the hope of some person being appointed by the British government who might look after their own subjects, (a hope which I am told he has often expressed,) I took the opportunity of saying that, however desirous her Majesty might be of showing her friendship, such a manifestation as the appointment of a consul could hardly be expected; whilst in his capital practices (referring principally to cannibalism) were daily occurring which all civilized people looked upon with horror; and that he could give no better proof of his wish to merit such a favour, than by his example and influence inducing his people to abandon it. This chief, and the second in authority at Bau, (Navindi,) having accompanied me on my return to the ship, I entertained them on board for two days, exhibiting, at their desire, shot and shell practice, &c., which they are fully capable of understanding, although they had but little notion of the power of our arms until the destruction of the town of Noundavau by her Majesty's ship "Calypso" in June last, as a punishment for the murder of two white men by the inhabitants of that town.

5. I left Ovalou on the 18th, anchoring the same evening in Nandi Bay, and found that all was now quiet, although there had been a threat on the part of the people of So-Lévu to plunder the mission-house and village in April last. The people of these places are relations and friends; but those of So-Lévu being the more powerful, had been accustomed to exact many presents, &c. from their neighbours. Since their adoption of Christianity, however, these had considered themselves released from any such obligations; and hence the attempt made by those of So-Lévu. The Christian party, although much less numerous, knowing the advantage of union, stood to their arms, and determined to defend the place—a circumstance so unusual in the Fecjee warfare, that the others at once came to an understanding and retired, remaining ever since on good terms. Thinking, however, that the appearance of the ship at So-Lévu would have a good effect, I embarked the resident missionary, the Rev. Mr. Hazlewood, and proceeded thither. The principal chief at once came on board when sent for, and expressed himself in a most friendly way towards the missionaries, throwing the blame (I believe justly) on another man, who was now absent. To amuse the chief, and show him at the same time that his town was in our power, I fired one or two shot at an object on the reef; and I do not think there is any fear of an outrage towards white people being committed in that quarter.

6. At Bua, or Sandalwood Bay, the Rev. Mr. Williams considered affairs to have returned to a satisfactory state, since the death of the chief before mentioned, and was not apprehensive of anything of the kind recurring. The plot

of last year was part of a wild scheme this man had formed, of making himself distinguished in war; and, although the mission station (being only separated by a narrow river from his head-quarters) might certainly have suffered, he must soon have been crushed. The present chief, the brother of the late one, being too ill to come on board, I went and saw him at his village, and found him a quiet, inoffensive man. As I was told that the late chief, on being reminded of the destruction of Noundavan, by the "Calypso," only two months before, had ridiculed the power of a ship of war to injure him, as he could always retire to the mountains, leaving his empty village in their possession, I took occasion, in speaking to this chief of the lately contemplated outrage, to explain to him Tui Viti's promise to me, that he would take care to permit nothing of the kind in future; and as few in these islands are desirous of exciting the displeasure of Bau, I believe this would be most efficacious in checking them, even were they disposed, which at present they are not, to make any attack on the mission. I returned to Ovalau to land the pilot, and quitted the Feejees finally on the 27th of August.

7. Various complaints had lately been made to the Governor of New South Wales, (which his Excellency forwarded to me,) of the conduct of certain Englishmen in these islands, and of one in particular (Charles Pickering) who has been well known for some years as a man of bad character. When at Vewa, I accordingly made inquiries as to the truth of these accounts, but found that of the particular crimes this man and the others were accused of, none were said to have been committed since the visit of the "Calypso," when Captain Worth examined into several cases, but came to the conclusion, which I also did, that none of them admitted of legal proof. I contented myself accordingly by repeating to those men who had been complained of, that future misconduct would lead to their being removed from the islands; and, if proof could be obtained, to a trial before the Supreme Court of New South Wales. I have little doubt that many murders and other atrocities have formerly been committed by Englishmen, who had adopted the savage customs of the people among whom they were living; and who considered themselves secured from detection by the want of communication with their own country or colonies; but I believe this is seldom or never the case now. One of the gentlemen who in the present instance had forwarded the representations above alluded to, to the governor of New South Wales, had evidently been imposed upon by a chief of Rewa, named Thokonauto, or Phillips, who is said to be very intelligent, and to speak English fluently, but is a man of depraved and corrupt character. There is a considerable number of white men, principally British and Americans, who have formed a settlement at Levuka, in the island of Ovalau. About six years since they had been sent away from this place by Thakambau, (who suspected them of favouring his enemies,) and established themselves at So-Lovu, (or Sua Lib,) in Vanua Levu; from which place, however, they returned, at his solicitation, the beginning of this year. Including women (principally Feejeeans) and children, the community amounts to about 200 souls; and, as they are generally very respectable and well-behaved people, they exercise a salutary influence both over other white persons in the islands as well as the neighbouring natives. Several are shipwrights, and have built small vessels, and pilots are always to be found among them. One served in that capacity and as interpreter on board the "Havannah" for fourteen days, and I had every reason to be satisfied with him. As the navigation of the Feejees is almost impossible without a local pilot, and as the position of Levuka is one of the most accessible, ships coming to the islands will find these men of essential service.

8. A superstitious practice has long prevailed among these people, of putting to death all persons, native or foreign, who were wrecked on their coasts, which will account for the dread they have been generally held in by small vessels. This practice, however, I have reason to believe, is given up, where white men



are concerned, over the greater part of the islands, and certainly in all to which the authority of Thakambau extends. Murders for the sake of gain have been occasionally committed, the last being that of an Englishman and an American at Noundavau, for which Captain Worth, of the "Calypso," took and burnt the town. This example is generally considered here to have been of great service, more as showing that foreigners are under the protection of their own governments, than from its severity, as it is now said that few, if any, were killed on the occasion. It is my opinion, however, that such measures should only be resorted to in extreme cases, and after a thorough examination into all the circumstances attending them: both because the guilty persons being rarely the sufferers, the indignation of the others keeps up a feeling of irritation against all strangers; and also because rival chiefs, satisfied to have their battles fought and their enemies destroyed by proxy, are ready to bring false accusations of the kind against them for that purpose. Thakambau, for instance, was desirous that I should punish the chief of Mothuata (against whom he has a feeling of enmity) for an alleged murder committed some years since, although, from all I could learn, he at least was not to blame in the business.

9. Although the murder of shipwrecked persons is supposed to be a religious duty, there can be little doubt that the desire to eat the bodies is the principal cause of its continuance, human flesh being esteemed above all other kinds of food. About the end of July, three weeks before the arrival of the "Havanah," fourteen women and one man belonging to a neighbouring town (with whom no war existed) had been stolen from the reefs, whither they had gone to pick shell fish, and brought to Bau, to entertain the people of a tribe who had arrived there with their periodical tribute, two or three having been previously entrapped from other quarters and eaten. The missionaries, Messrs. Lyth and Calvert, were absent from Vewa at the time, but their wives immediately crossed over to Bau, and having in the most daring manner forced themselves into the house of Tanea, the father of Thakambau, (a piece of sacrilege for women to attempt,) begged the lives of these unfortunate wretches. Ten had been already slaughtered, (two of them in the hearing of these heroic ladies,) but the lives of the remainder were granted to their entreaties. On my visit to Bau, I was shown the remains of the bodies suspended to trees, and the ovens in which they had been cooked, by some of the persons in whose behalf this feast had been prepared, with evident surprise on their part that such a sight should excite any feelings of horror or disgust. The missionaries, whose treatment of these people is marked by extreme toleration and good judgment, are however not without hope that the practice of cannibalism is on the decline, and that the influence of Thakambau (who does not yet feel himself strong enough to take decided steps) will be exerted to stop it. A favourable sign had shown itself on Messrs. Lyth and Calvert's visit above mentioned, they having been followed to their canoe by crowds of women, thanking them for their interference—a feeling which a year or two since they would not have dared to express, even could they have estimated the sense of duty and self-devotion which prompted so noble an effort.

10. As Thakambau had requested me to write to him before I left the Feejees, I did so, taking care to urge both the expediency of protecting the well-conducted white men, (which he is quite disposed to do,) and above all, of exerting his increasing authority in repressing practices which all civilized nations looked upon with horror. As he is a man quite capable of valuing the opinion of other countries, the proof thus afforded that the feeling on this point is not merely a fancy of the missionaries, will probably not be lost upon him.

11. The articles of export from the Feejees are cocoa-nut oil, tortoiseshell, and "beche de mer," and are inconsiderable in amount. The latter is said to

be much diminished in quantity of late years. The sandalwood, which was once procured here, is quite exhausted. One or two small vessels from Sydney, and a few regular American traders, frequent the islands. They have a large internal trade in native articles—such as cloth, cordage, and pottery, which is carried on with great activity in their large canoes. The timber which grows in the island is well adapted for the construction of these, and might, with other kinds of hard wood, prove to be worth exporting. Some of the islands are very thickly inhabited, but the missionaries, who have the best means of information, believe the population is diminishing; which, considering the number killed in their treacherous warfare, and for cannibal purposes, the strangling of a deceased chief's wives, and the putting to death all old people, is most probable. It is also supposed that the practice of war only became habitual at a late period, and was certainly aggravated by the assistance of white people, (several of them runaway convicts,) who first made their appearance in the Feejees about thirty years ago. The adoption of Christianity, and the concentration of power in the hands of one individual, will (it is to be hoped) tend to improve this state of affairs; and it cannot be doubted that a show of sympathy with their interests on the part of our government, would materially advance these desirable objects. They have as yet (with the exception of a few head of cattle) no stock but pigs. Many of the islands would make good pasture, but the general insecurity of property prevents any improvement of the kind.

12. The difficulty attending the navigation of these islands has been much lessened by the publication of the charts of the United States Exploring Expedition, which we found generally very correct, and which every ship coming here ought to be provided with. The only plan supplied by the Hydrographical Office is worse than useless, and could only tend to lead a ship into danger.

#### *The New Hebrides, New Caledonia, and the Loyalty Islands.*

1. These islands, few of which have ever been visited by a ship of war, are in a commercial point of view of much greater importance to our Australian colonies than any others in the Pacific, from ten to twenty vessels being constantly engaged in the lucrative trade in sandalwood and "beche de mer," with China. For the collecting and shipping of these articles two establishments have been formed within the last few years—viz., one at Aneiteum, the southernmost of the New Hebrides, and another at the Isle of Pines, immediately to the south-east of New Caledonia, giving employment to a considerable number of white men in addition to those navigating the vessels. The former appears to be principally the property of a Mr. Paddon, formerly commanding a vessel in the trade, who resides there, and is extending his speculations, setting up saw mills, &c.; and the latter to a respectable man in Sydney, a Mr. Town and his partners—the establishment being under the charge of an agent. These and other merchants have also occasional agents at different islands, collecting sandalwood and "beche de mer" for muskets, axes, cloth, tobacco, &c., which is called for by trading vessels, and taken either direct to China, or to Sydney to be shipped for that market.

2. The inhabitants of these islands are of various mixtures of races, those of Tana and New Caledonia being blacker and more woolly haired than the people of the Loyalty Islands, and Vate, or Sandwich Island, to the northward, who appear to have more of the Polynesian blood and language than their neighbours. They are, however, generally cannibals (as many have confessed to myself and other officers); although, unlike the Feejeeans, they eat only the bodies of their enemies, and in some cases those of shipwrecked persons, whom they consider a fair prey—a fact expressed by the saying; that

"all is fish which comes out of the sea." The New Hebrides are more fertile than New Caledonia and the Loyalty Islands, the latter (low coral islands) being generally barren, and the inhabitants apparently very poor; but sandalwood grows more or less at all, being perhaps the most plentiful at Erromango.

3. Since the commencement or revival of this trade, about 1840, it has (with a view to prevent competition and interference by regular authority) been carried on until lately with the secrecy generally observed in contraband transactions, which makes it still difficult to obtain precise information concerning it. It was well known, however, that the men employed were usually of reckless character; and accounts of fights with the natives, and treacherous attacks on both sides, attended with considerable loss of life, occasionally reached Sydney. When at Tonga-tabu, I was informed by a young chief, (Methuselah Tæ,) who was one of the party, that some years ago (it is believed about December 1842) two vessels under British colours, belonging to Sydney, (the "Sophia," Henry, master; the "Sultana," Scott,) and another, (said to have carried the Tahitian flag,) commanded by a man named Demission, formed a regular expedition at Tonga, for the purpose of forcibly cutting sandalwood at the New Hebrides. Sixty Tonguese, armed with muskets, were embarked, twenty in each vessel, under a chief named Maafu, brother of the then King (Josiah Tobou). The expedition called at Lakemba to procure more men, (which they did not succeed in doing,) and then proceeded to Erromango, where the party was landed, and a quantity of sandalwood cut and embarked. Having had an affray with the natives, one of whom was shot, they went on to Vate, or Sandwich Island, and continued their depredations. The Tonguese stated that his countrymen were landed armed, (the white men remaining on board,) and ordered to cut wood. They soon had a quarrel with the people of the island, who, having no muskets, were defeated with a loss of twenty-six killed. The others having fled to a cave for shelter, their pursuers secured the entrance, and piling up a heap of houses and rubbish, set fire to it and suffocated them all. One of the Tonguese only was killed by an arrow; but in spite of these affrays, and the remonstrances of Maafu, Henry, who commanded the expedition, kept them cutting wood for three days longer, before he would accede to their wish to return home. This statement was made to me in the presence of the governing chief, Shadrach Munui, and all the missionaries; and several others were pointed out as having been on the expedition, the history of it being perfectly current with all the inhabitants of the island. At Sandwich Island two chiefs (Tongalulu and Talipoa Ura) corroborated the story, saying that on one side of the harbour forty, and on the other twenty, of their people, were killed on the occasion. The three vessels returned to Tonga-tabu, taking some natives of Erromango with them, (two of whom I saw,) and afterwards went to Tahiti, where Henry is said to be at present engaged as a pilot by the French government, to which one at least of the vessels, the "Sultana," was afterwards sold, and is now in their employ.

4. Forcible measures, though not to the same extent, have frequently been resorted to by other vessels, and all kinds of excesses have been committed by the undisciplined crews, who always carry arms, and are but too ready to make use of them. It is not surprising that the natives of the different islands (anxious though they are to traffic with Europeans) consider themselves justified in taking every advantage of men who treat them in such a manner. During the last few years, accordingly, constant disputes, attended with loss of life on both sides, have taken place. The following list comprises probably a very small number of what have actually occurred, information being very seldom given by the white men engaged, and impossible (from the want of interpreters and knowledge of the many dialects) to be obtained from the natives.

<i>Vessels and Circumstances.</i>	<i>Dates.</i>
1. Boat's crew killed at Marr; supposed to have belonged to the schooner "Martha," of Sydney.	About the end of 1841.
2. Brig "Star," of Sydney, taken, and all the crew killed, at the Isle of Pinea.	October, 1842.
3. Brigantine "Catherine," of Sydney, attacked, several killed and wounded, the vessel nearly blown up, at the Isle of Pinea.	Early in 1843.
4. Barque "Magnet," of Sydney, attacked at Lifu, chief and another native shot; afterward long-boat attacked, and several natives killed, their canoe and catamarau seized and kept.	October, 1843.
5. Brig "Brigand," of Sydney, attacked at Marr; seventeen of the crew killed and wounded.	Nov. 1843.
6. Cutter "Sisters," of Sydney, taken at Marr, and the crew (eleven in number) killed.	End of 1843.
7. Affray at Tana with the crew of a vessel, in which some Samoan missionary teachers were embarked; one seaman and five natives killed, several wounded.	Early in 1846.
8. Barque "British Sovereign," wrecked off Vate, or Sandwich Island; all the crew except two killed.	April, 1847.
9. Schooner "Elizabeth," of Sydney, boat capsized at Erromango, with five men—two killed. This vessel had several affrays with the people of Erromango, and was at last lost in February, 1848, when all the crew perished.	1847.
10. An expedition undertaken by the boats of the barque "Spy," of Hobart Town, up the river Kanela, in New Caledonia; one man wounded, and many natives said to have been killed.	1847.
11. Two boats' crews of the schooner "Vanguard," of Sydney, eight in number, including the master, killed at Numea, in New Caledonia.	October, 1847.
12. Two boats' crews of the barque "Avon," of Sydney, attacked at the same place, several wounded; first mate lost an arm and an eye.	January, 1848.
13. A small vessel taken off Resolution Bay, Tana, Master (white, notorious among the islands), and two others killed. The perpetrator of this deed was afterwards clubbed by his own people.	May or June, 1848.
14. Schooner "Terror," of Sydney, boat taken, and one man killed, at Erromango. Another vessel, the "Daniel Watson," is said afterwards to have sailed down the coast, firing at all natives indiscriminately whom they could see. The master or mate of another vessel is also said to have fired at and killed a friendly chief, who was swimming on shore from the schooner.*	About June, 1848.

5. As a means of checking such proceedings for the future, I determined to call at as many places frequented by sandalwood traders as my time would permit, attempting to open some communication with the chiefs, and explaining to them the necessity of both parties adopting a different system in trading. In all these places I found the chiefs perfectly disposed to listen to reason, having generally no concealment about the fights, &c., which have taken place, but seeming to consider them the necessary consequences of carrying on a barter with Europeans. The Bishop of New Zealand had told me at Auck-

\* For the total destruction by the natives of Mr. Fitzgerald's establishment on the north end of New Caledonia, as well as of the French Missionary Station at Yengin or Balade, see the 'Nautical Magazine' for June, 1850, p. 359.—ED.

land his intention of visiting these islands about this time, to communicate with the Samoan teachers connected with the London Missionary Society, and ascertain the practicability of placing missionaries at different localities. I fell in with his Lordship accordingly off Tana, on the 2d of September, and continued in company with him until he quitted the isle of Pines on the 22nd.

6. At Resolution Bay, Tana, I found that an Englishman, who had deserted but a few days before from a Sydney vessel, had on the day previous to our arrival joined a war party of the natives, at the request of one of the chiefs (from whom he expected some favour), and shot a man of the opposite side. I accordingly detained and removed him from the island, explaining to the chief, who was perfectly satisfied of the justice of the proceeding, my reason for doing so. This man had belonged to the Vanguard schooner when her boats were seized and their crews killed at Numea, in New Caledonia, in October, 1847, and was afterwards useful in pointing out that and other places on the coast. I have since set him at liberty at Sydney, it being impossible to produce legal evidence of the act of which he was accused.

7. I proceeded to sail round the island of Tana, where there are several anchorages, frequented by vessels, and where I had reason to believe squabbles had taken place during the last few weeks, landing occasionally to communicate with the natives, and induce them to come off to the ship, that they might have some notion of the purpose of our appearing there. I then ran across to Vate, or Sandwich Island, anchoring in a capacious harbour on its south-west side, which I named "Havannah" harbour, she being the first of her Majesty's ships which had anchored there. Having had the same satisfactory interview with the natives, I proceeded (touching at Ngea, the westernmost of the Loyalty group) to Yengin, a harbour on the east side of New Caledonia, about 50 miles to the S. E. of Balade, where the chief, an intelligent man, who had been at Sydney, and speaks some English, is considered a very friendly person to Europeans. I continued down the coast, calling at the other two Loyalty Islands, Lifu and Marr; at the latter of which some of the most desperate attacks on vessels had been made. As the character of the people, however, has so much improved, as to admit of six missionary teachers residing among them, and the chiefs (father and son, who had headed the attacks alluded to) were dead. I thought it sufficient to demand that a chain cable and some smaller articles, said to have belonged to the unfortunate cutter "Sisters," should be delivered up, which was done immediately, with the most positive promises that no outrage of the kind should be again attempted. It should be stated, in fairness, that the reason given by those people for the attack on the "Sisters," was the fact of the principal chief, Jewe, having been roped-ended by the master during a dispute about the payment for sandalwood—an insult which no islander in the Pacific, especially one of high station, could brook.

8. At the Isle of Pines, where, as mentioned before, there is a settlement of Englishmen collecting wood, &c., for Sydney merchants, and where, in consequence of the considerate manner the natives have been treated, the best feeling exists between both parties, I procured a native pilot or guide for the district of Numea, on the south-west side of New Caledonia. On arriving there on the 25th of September, I sent for the chiefs who were supposed to have instigated the attack on the "Vanguard" and "Avon's" boats, in October, 1847; two of them came on board, without any pledge being given on the officer's part for their safety, but were not identified by the man (Robert Stephens) who had been in the former vessel, as having been among the attacking party. Having been informed that the boats in question were still in the possession of the people of another settlement, Jitema, a few miles down the coast, I sent Lieutenant Pollard to demand them, and detained the chief (Angalla or Muiru) until they were given up. Lieutenant Pollard returned with two chiefs of Jitema, who had at once given up the only remaining boat, which however was not in a fit state to be brought off. Seeing that they were

all thoroughly alarmed, throwing the blame of the quarrel on the master of the vessel, and the people of the isle of Pines, and finding it quite impossible, from an ignorance of their language, to ascertain the true facts of the case, I thought it unnecessary to take any further steps, feeling satisfied that they will not willingly engage in any more treacherous enterprises. All the chiefs, on quitting the ship, and being relieved from their fears, made, as far as they could be understood, the most solemn promises to protect white men in future. Whether they will be enabled to keep their word will of course depend upon the way they may be treated; but the occasional visit of a ship of war, and publicity in general on all matters connected with these people, would certainly be the best means of ensuring it.

9. I sailed from the coast of New Caledonia for Sydney on the 28th of September, and regret that my time did not allow me to see more of all these islands, particularly the two larger of the New Hebrides—*Espiritu Santo* and *Malicolo*, which are little known, except to a few sandalwood traders.

10. For the reasons above stated, it is impossible to form any estimate of the population of these islands. On all the coasts they show in great numbers; and from the appearance of New Caledonia, especially on the north-east coast, where the hills are carefully cultivated and irrigated, and where they speak of hostile inland tribes, it must be considerable. There are no English missionaries in the group, but there are Samoan and Rarotongan teachers in connection with those in the *Navigators*, at the latter island, and also at *Vate* and *Marr*.

11. The Bishop of New Zealand during his late visit selected, from among many who offered at different places, three or four lads, whom he has taken to Auckland for education at the college, and who, it is to be hoped, will be useful, ultimately, as interpreters; and his Lordship is, I understand, in hopes of being able to place one or two missionaries in New Caledonia. There are two belonging to Nova Scotia, who are ready to take advantage of any opening, residing for the present at *Aneiteum*, where, as at the isle of Pines, the French Roman Catholic mission has stations with the same view. At the latter place, I met the French bishop, who, with his people, had been obliged to leave *Balade*, in New Caledonia, about two years ago, now returning from Europe by way of *Tahiti*, with several priests, to re-establish themselves at *Yengin*, where they had formerly purchased about 200 acres of land. I was given to understand that the hostility of the natives to them at *Balade*, arose from the conduct of the crew of the French corvette de charge "*La Seine*," who, after the wreck of that ship in 1846, remained there some months, until vessels could be procured to take them away. The crew of the "*Brillante*" corvette, who afterwards came to remove the mission, were attacked, and five men wounded by the natives. Those of *Yengin*, however, being tolerably well disposed towards foreigners, and under the authority of an intelligent chief (*Basset* or *Barret*), who had carefully protected the land of the mission during their absence, and fully acknowledges their title to it, it is probable they will find no difficulty in settling, and with common prudence on their part, establishing themselves firmly there. Should the French Government entertain (as is generally believed in these seas) any scheme for the occupation of New Caledonia, such an establishment would (as in other places) afford cause for the visits of ships of war, and perhaps occasional interference on its behalf, with the chief's authority. The bishop himself told me that he was to have left *Tahiti* in a ship of war, if one could have been spared, and he did come to *Aneiteum* in a schooner (the "*Sultain*") belonging to the Government.

12. That a little regulation only is necessary to establish a fair and practicable intercourse between our people and the inhabitants of these islands, is evident from the beneficial effects already produced in this respect by the two establishments (or factories as they may be called) at *Aneiteum*, and the isle

*New Hebrides, New Caledonia, and Loyalty Islands.*  
*on of visiting these islands at first this time, to see if it*  
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 visits by her Majesty's ships.  
 Hilliard, the master of the "Havannah,"  
 ing information, and making drawings of  
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 their Lordships, however, think it advisable that  
 most frequented parts should be made, I beg to  
 steam-vessel "Acheron" might during the winter  
 er season in these latitudes) be most advantageously  
 without interfering in any material degree with that of  
 which Captain Stokes is now occupied. Should their  
 prove of this distribution of the "Acheron's" time, a small  
 readily procured at Sydney, which, whilst carrying on the  
 also execute the very important duty of attending to our com-  
 sts in that quarter.

awford says that, "with the exception of the negroes of the Pacific  
 a language, essentially the same, is spoken from the Feejee to Easter  
 and from the Sandwich Islands to New Zealand; and the men who speak  
 e of the same race. In that language is found in all about 100 words of Malay  
 Javanese.

"Now, two questions arise out of these facts. The first, how come one language  
 and one people to be so widely spread? The tribe must have extended itself origi-  
 nally from one central point, although afterwards probably by intermediate steps.  
 From the Friendly, or Society Islands, all the way to Easter Island, there exist some-  
 thing like stepping stones. And the wanderers would be all the while within the  
 tropics, and so across the equator to the Sandwich Islands. But the difficulty is  
 with New Zealand. Four islets, called in the Arrowsmith maps, Macaulay, Curtis,  
 Sunday, and Recherche, might have formed the resting-places. I know nothing  
 of them but the name and locality, and beg information. What are the prevailing  
 winds? Are they inhabited—and if so, by what race? I suppose the Malays to  
 have got into the islands of the Pacific not to the N. but to the S. of the equator,  
 and by Torres Straits. There is a larger proportion of Malayan words in the  
 dialect of the Friendly Islands than in Tahitian or Sandwich Islands; and it seems  
 to diminish in proceeding eastward. It is difficult to fancy who these Malays  
 could be, but, probably, tempest-driven pirates. They could not be the Tripang  
 fishers that visit the shores of the gulf of Carpentaria, because these are natives of  
 Celebes, and speak languages different from Malay."—ED.

According to Dr. Latham, there are but two Vocabularies of the language of  
 New Caledonia—one in Cook's Voyage, the other in La Billaudière's. Both are  
 scanty, but the latter is the longest.

"A priori, we expect to find the New Caledonian like the language of Tanna and

Mallicollo. It is so to a certain extent only. The three are expressly stated to be mutually unintelligible. This is what we expect.

But as far as the scanty vocabularies that supply our philological *data* justify an inference, there is something connected with the New Caledonian which we do not expect.

It has points of similarity so definite with the *Tasmanian* dialects of Van Diemen's Land, as to suggest the probability of the Tasmanian population having reached their locality after a migration *round* Australia rather than *across* it—a point noticed in the Appendix to Mr. Jukes' 'Voyage of the Fly,' and a point to be taken along with the significant fact that the Van Diemen's Land population differs in dialect *more*, and in physical appearance *much more*, from the Australian than the geographical proximity of the two countries prepares us to expect.

It also has—a point investigated in the Appendix to Mr. M'Gillivray's 'Voyage of the Rattlesnake,' now in course of publication—equally definite and equally remarkable points of similarity with the *Louisiade* dialect, more so than with those of the New Hebrides.

Putting these two facts together, the philological phenomena of the New Caledonian suggest a migration *via* Louisiade to New Caledonia and Van Diemen's Land, separate from and independent of the one which carried the stream of population from New Guinea to the New Hebrides.

Upon the importance of additional *data*, either to confirm, to modify, or to set aside this doctrine, it is unnecessary to enlarge.—Ed.

At p. 177 of the 'Journal of the Royal Society of Van Diemen's Land,' an account is given of a canoe lately picked up by the ship "Prince Regent," Captain Mores, in lat. S. 1° 25', and long. E. 171° 45', about 200 miles from land. In this canoe were three of the inhabitants of Henderville's Island, whence they had been drifted in a gale.—Ed.

For further Notices of the Islands of the Pacific see the Articles in 'The Nautical Magazine,' 1850, by Captain Sir E. Home, R.N., F.R.G.S., and in Jameson's 'Edinburgh Journal' for January to April, 1851, by Mr. Dana.—Ed.

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XIII.—VOCABULARY of the Language of the Yule Indians, who inhabit the Rivers and the Coast of Darien, from the mouth of the Atrato to the Coast of San Blas. By DR. ED. CULLEN.

Panamá, Oct. 6, 1851.

water	tee	wood	chóó
ire	cho	meat	chana
inn	ipé	dog	achu
noon	nee	musquito	kwi
tars	eseekwa	bird	chikwi
rees	chowala	eggs	chikwiala
eaves	chowalka	red	kibniti
house	neka	large	tumati
nan	mastola	little	totogwa
roman	pundola	white man	chipugwa
oy	inachigua	black man	chichiti
irl	punagua	handsome	itanlegi
child	maehi totoqua	ugly	yagitaglegi
big man	mastomati	alive	tula
little man	mastoতোqua	dead	purkwisa
thunder	marra	cold	tampe
chingo (small canoe)	ultotoqua	hot	ugueti
tiger	achuieti	this	iktigue
lion (large tiger)	achukiniti	that	ugue
river	tiguala	all	pelo
iguana	arri	much	yéé
lagarto (cayman)	thayma	who's there ?	togwa chi ?
snake	nagupe	near	iptigine
turkey, wild	chigli	to-day	imiipe
parrot	quackwa	yesterday	chae
guacharaca	charcaca	yes	éé
picolargo	guelleguelle	no	chuli
deer	cogue	to dance	quile
turtle	patti	to sleep	kapenai
my husband	my an-chu gui	to speak	chumake
my wife	my am-pundola	to see	petáke
my son	my an-uchu	to sit down	pechique
my daughter	am punagua	to come	nene
brother	angmechati	to go	nae
sister	anuka	the face	gwawkala
heart	quakki	hair	chagli
blood	ape	ear	uwa
chief	chogualipeti	eye	ibia
chief's daughter	chogualipeti echis- qua	nose	au uchuu
friend	aya	mouth	kagya
bow	kinki	tongue	quawpina
arrow	cheekwu	teeth	nukala
poison	corocoa and iná	beard	chica
axe	akana	neck	tkala
knife	eystina	arms	ankala
tobacco	guuala	hands	anchunkala
sky	nibtala	fingers	cóó
morning	pani	nails	cóó nu
evening	chetogi	body	anabgara
rain	teeguiyeti	leg	thugwa
earth	naba	gun	kinki
valley	neguepa	powder	kinki boo
island	tuboo	lead	kinkwaka
salt	palu	canoe	ultumati
		calabash	noka

wild hog	yanu-chapurri	8	pabagi
sea	termala	9	pakebagu
flint	akkwanucha	10	ambe
steel	chekar	11	ambegwargine kaka
two canoes	ultumati walbogwa		quenchaqua
stone	kkwa	12	ambekaka pocoa
paddle	cammi	13	ambekakapagwa
cutlass	echa	20	tulaguena
the river is deep	tee yegualgugioe	21	tulaguenakakaquen-
the river is shallow	tee thathala		chaqua
the river's source	tee tokoo	name	nukka
There are stones	tee gingeakkwa	what's your name?	igi penukka?
(rocks) in the		Carolina (Port	termankaka
river		Escocer)	
There will be much	iptigue dadogue imi-	The tide is rising	timureti nac qualo-
rain to-night	mutiki witaguon-		mai
	tigue authake	The tide is falling	timureti arreogali
head	ochana	Where are you go-	piyal penai?
foot	naca	ing?	
feet	nacamala	Whence come you?	piyal petanigi?
to eat	maskune	Let us go	namala
to drink	cope	Let us go bathe	omamala
rice	caganturpa	How do you do?	penuguétigua?
maize	opa	How are your sons?	penuchugana nug-
plantain	machee		veti?
cocoa	okoba	Where did you come	piya akari petani-
forest	chapur	from?	gi?
mountain	chapurmala	Where did ye come	piya akari petani-
fish	huguaw	from?	mala?
little	icheguaw	Whence did your	peyayamala piya
much	ichogi	friends come from?	kartanigi?
wait a while	anapta quelli	When will you kana	petakowe?
night	mutikuti	come?	
day	ibigine	Come soon	quarve petakowe
good	nugueti	Give me fire	augacho cheeyalo
bad	istalga	Your hand	peyaukala
it is late	pato chetogi	Your hands	peyaukalmala
come with me	ambag neni	The chingo is ready	kuwaluluai
will you come?	ambag betake?	Two canoes have	walapakwa ulnonigi
I	ani	arrived	
you	pée	A chingo has ar-	ulgwen nonigi
he	aa	rived	
we	namala	A canoe has ar-	walguen ulnonigi
ye	pemala	rived	
they	amala	How is your son?	pemachi nugueti?
rivulet	teana	When will the canoe	ingu ulak-te-yogney
dry season	yola	come from up the	nakwalakari?
rainy season	tee gini	river?	
old	cheleti	When will the canoe	ulo chaua ulnonigo
young	nuchukwa	come from down	diba te yalakari?
palanka or pole	ulchogwala, in San	the river?	
	Blas language	My brother is in the	augmechati wircha-
	otigali	bush hunting	nati
white woman	pundola chipugwa	At what time shall	chana nang malowe?
black woman	pundola chichiti	we go?	
rum	inatitiliti, any liquor	At noon	ipe yolapugwe
1	quenchaqua	At midnight	cabguena
2	pocoa	We will go before	ipe yolukugwe na-
3	pagwa	noon	malogue
4	pakegua	We will go before	yocab geungtagwe
5	aptali	midnight	namalogue
6	nerkwa	After midday we	ipe agupinitele na-
7	kugle	will go	malogue

## I N D E X

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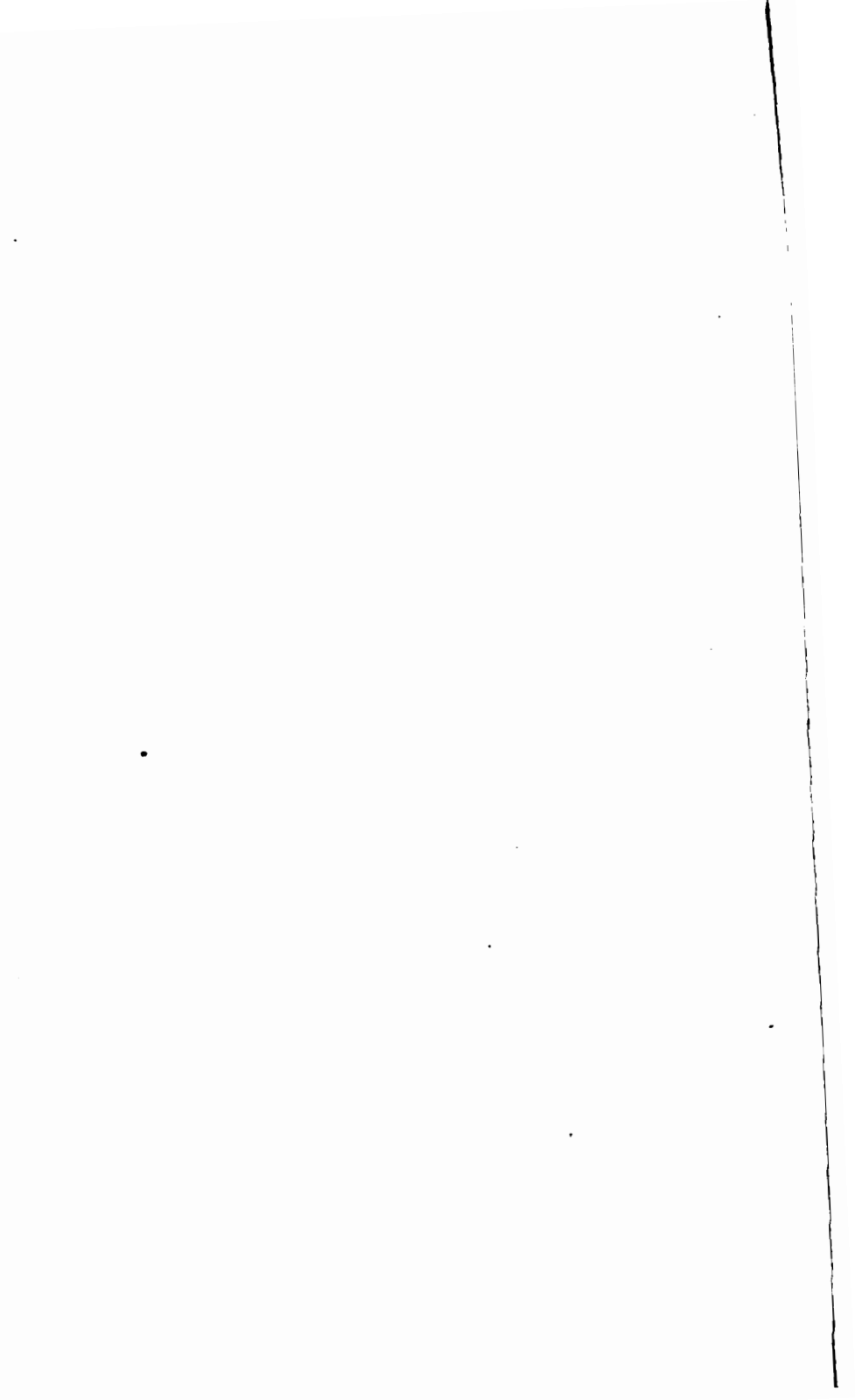
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